



Service Manual

Models ***6036, 6042, 8042,*** ***10042 & 10054***

6036
S/N 0160039338 & After including
0160024571 & 0160037911

6042
S/N 0160039075 & After
8042, 10042 & 10054
S/N 0160029593 & After

31200353

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April 14, 2011

EFFECTIVITY PAGE

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EFFECTIVITY PAGE

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Section 1

Safety Practices

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Safety Practices

1.1 INTRODUCTION

This service manual provides general directions for accomplishing service and repair procedures. Following the procedures in this manual will help assure safety and equipment reliability.

Read, understand and follow the information in this manual, and obey all locally approved safety practices, procedures, rules, codes, regulations and laws.

These instructions cannot cover all details or variations in the equipment, procedures, or processes described, nor provide directions for meeting every possible contingency during operation, maintenance, or testing. When additional information is desired consult your local authorized service distributor.

Many factors contribute to unsafe conditions: carelessness, fatigue, overload, inattentiveness, unfamiliarity, even drugs and alcohol, among others. For optimal safety, encourage everyone to think, and to act, safely.

Appropriate service methods and proper repair procedures are essential for the safety of the individual doing the work, for the safety of the operator, and for the safe, reliable operation of the machine. All references to the right side, left side, front and rear are given from the operator seat looking in a forward direction.

Supplementary information is available from JLG in the form of Service Bulletins, Service Campaigns, Service Training Schools, the manufacturer website, other literature, and through updates to the manual itself.

1.2 DISCLAIMER

All information in this manual is based on the latest product information available at the time of publication. The manufacturer reserves the right to make changes and improvements to its products, and to discontinue the manufacture of any product, at its discretion at any time without public notice or obligation.

1.3 OPERATION & SAFETY MANUAL

The mechanic must not operate the machine until the Operation & Safety Manual has been read and understood, training has been accomplished and operation of the machine has been completed under the supervision of an experienced and qualified operator.

An Operation & Safety Manual is supplied with each machine and must be kept in the manual holder located in the cab. In the event that the Operation & Safety Manual is missing, consult your local authorized service distributor before proceeding.

1.4 DO NOT OPERATE TAGS

Place Do Not Operate Tags on the ignition key switch and the steering wheel before attempting to perform any service or maintenance. Remove key and disconnect battery leads.

1.5 SAFETY INFORMATION

To avoid possible death or injury, carefully read, understand and comply with all safety messages.

In the event of an accident, know where to obtain medical assistance and how to use a first-aid kit and fire extinguisher/fire suppression system. Keep emergency telephone numbers (fire department, ambulance, rescue squad/paramedics, police department, etc.) nearby. If working alone, check with another person routinely to help assure personal safety.

1.5.1 Safety Alert System and Signal Words

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



1.6 SAFETY INSTRUCTIONS

Following are general safety statements to consider ***before*** performing maintenance procedures on the telehandler. Additional statements related to specific tasks and procedures are located throughout this manual and are listed prior to any work instructions to provide safety information before the potential of a hazard occurs.

For all safety messages, carefully read, understand and follow the instructions ***before*** proceeding.

1.6.1 Personal Hazards

PERSONAL SAFETY GEAR: Wear all the protective clothing and personal safety gear necessary to perform the job safely. This might include heavy gloves, safety glasses or goggles, filter mask or respirator, safety shoes or a hard hat.

LIFTING: **NEVER** lift a heavy object without the help of at least one assistant or a suitable sling and hoist.

1.6.2 Equipment Hazards

LIFTING OF EQUIPMENT: Before using any lifting equipment (chains, slings, brackets, hooks, etc.), verify that it is of the proper capacity, in good working order, and is properly attached.

NEVER stand or otherwise become positioned under a suspended load or under raised equipment. The load or equipment could fall or tip.

DO NOT use a hoist, jack or jack stands only to support equipment. Always support equipment with the proper capacity blocks or stands properly rated for the load.

HAND TOOLS: Always use the proper tool for the job; keep tools clean and in good working order, and use special service tools only as recommended.

1.6.3 General Hazards

SOLVENTS: Only use approved solvents that are known to be safe for use.

HOUSEKEEPING: Keep the work area and operator cab clean, and remove all hazards (debris, oil, tools, etc.).

FIRST AID: Immediately clean, dress and report all injuries (cuts, abrasions, burns, etc.), no matter how minor the injury may seem. Know the location of a First Aid Kit, and know how to use it.

CLEANLINESS: Wear eye protection, and clean all components with a high-pressure or steam cleaner before attempting service.

When removing hydraulic components, plug hose ends and connections to prevent excess leakage and contamination. Place a suitable catch basin beneath the machine to capture fluid run-off.

It is good practice to avoid pressure-washing electrical/electronic components. In the event pressure-washing the machine is needed, ensure the machine is shut down before pressure-washing. Should pressure-washing be utilized to wash areas containing electrical/electronic components, it is recommended a maximum pressure of 750 psi (52 bar) at a minimum distance of 12 in (30,5 cm) away from these components. If electrical/electronic components are sprayed, spraying must not be direct and for brief time periods to avoid heavy saturation.

Check and obey all Federal, State and/or Local regulations regarding waste storage, disposal and recycling.



Safety Practices

1.6.4 Operational Hazards

ENGINE: Stop the engine before performing any service unless specifically instructed otherwise.

VENTILATION: Avoid prolonged engine operation in enclosed areas without adequate ventilation.

SOFT SURFACES AND SLOPES: **NEVER** work on a machine that is parked on a soft surface or slope. The machine must be on a hard level surface, with the wheels blocked before performing any service.

FLUID TEMPERATURE: **NEVER** work on a machine when the engine, cooling or hydraulic systems are hot. Hot components and fluids can cause severe burns. Allow systems to cool before proceeding.

FLUID PRESSURE: Before loosening any hydraulic or diesel fuel component, hose or tube, turn the engine OFF. Wear heavy, protective gloves and eye protection. **NEVER** check for leaks using any part of your body; use a piece of cardboard or wood instead. If injured, seek medical attention immediately. Diesel fluid leaking under pressure can explode. Hydraulic fluid and diesel fuel leaking under pressure can penetrate the skin, cause infection, gangrene and other serious personal injury.

Relieve all pressure before disconnecting any component, part, line or hose. Slowly loosen parts and allow release of residual pressure before removing any part or component. Before starting the engine or applying pressure, use components, parts, hoses and pipes that are in good condition, connected properly and are tightened to the proper torque. Capture fluid in an appropriate container and dispose of in accordance with prevailing environmental regulations.

RADIATOR CAP: The cooling system is under pressure, and escaping coolant can cause severe burns and eye injury. To prevent personal injury, **NEVER** remove the radiator cap while the cooling system is hot. Wear safety glasses. Turn the radiator cap to the first stop and allow pressure to escape before removing the cap completely. Failure to follow the safety practices could result in death or serious injury.

FLUID FLAMABILITY: **DO NOT** service the fuel or hydraulic systems near an open flame, sparks or smoking materials.

NEVER drain or store fluids in an open container. Engine fuel and hydraulic fluid are flammable and can cause a fire and/or explosion.

DO NOT mix gasoline or alcohol with diesel fuel. The mixture can cause an explosion.

PRESSURE TESTING: When conducting any test, only use test equipment that is correctly calibrated and in good condition. Use the correct equipment in the proper manner, and make changes or repairs as indicated by the test procedure to achieve the desired result.

LEAVING MACHINE: Lower the forks or attachment to the ground before leaving the machine.

TIRES: Always keep tires inflated to the proper pressure to help prevent tipover. **DO NOT** over-inflate tires.

NEVER use mismatched tire types, sizes or ply ratings. Always use matched sets according to machine specifications.

MAJOR COMPONENTS: Never alter, remove, or substitute any items such as counterweights, tires, batteries or other items that may reduce or affect the overall weight or stability of the machine.

BATTERY: **DO NOT** charge a frozen battery. Charging a frozen battery may cause it to explode. Allow the battery to thaw before jump-starting or connecting a battery charger.

1.7 SAFETY DECALS

Check that all safety decals are present and readable on the machine. Refer to the Operation & Safety Manual supplied with machine for information.



Section 2

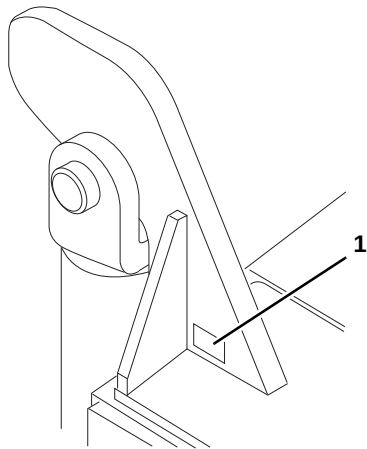
General Information and Specifications

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2.1 REPLACEMENT PARTS AND WARRANTY INFORMATION



OH0281

Before ordering parts or initiating service inquiries, make note of the machine serial number. The machine serial number plate (1) is located as indicated in the figure.

Note: *The replacement of any part on this machine with any other than **JLG** authorized replacement parts can adversely affect the performance, durability, or safety of the machine, and will void the warranty. **JLG** disclaims liability for any claims or damages, whether regarding property damage, personal injury or death arising out of the use of unauthorized replacement parts.*

A warranty registration form must be filled out by the **JLG** distributor, signed by the purchaser and returned to **JLG** when the machine is sold and/or put into use.

Registration activates the warranty period and helps to assure that warranty claims are promptly processed. To guarantee full warranty service, verify that the distributor has returned the business reply card of the warranty registration form to **JLG**.



2.2 TORQUE CHARTS

2.2.1 SAE Fastener Torque Chart

				Values for Zinc Yellow Chromate Fasteners (Ref 4150707)								
				SAE GRADE 5 BOLTS & GRADE 2 NUTS								
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load	Torque (Dry)		Torque Lubricated		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140)		Torque (Loctite® 262™ or Vibra-TITE™ 131)	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604	380	8	0.9	6	0.7				
	48	0.1120	0.00661	420	9	1.0	7	0.8				
6	32	0.1380	0.00909	580	16	1.8	12	1.4				
	40	0.1380	0.01015	610	18	2.0	13	1.5				
8	32	0.1640	0.01400	900	30	3.4	22	2.5				
	36	0.1640	0.01474	940	31	3.5	23	2.6				
10	24	0.1900	0.01750	1120	43	4.8	32	3.5				
	32	0.1900	0.02000	1285	49	5.5	36	4				
1/4	20	0.2500	0.0318	2020	96	10.8	75	9	105	12		
	28	0.2500	0.0364	2320	120	13.5	86	10	135	15		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	3340	17	23	13	18	19	26	16	22
	24	0.3125	0.0580	3700	19	26	14	19	21	29	17	23
3/8	16	0.3750	0.0775	4940	30	41	23	31	35	48	28	38
	24	0.3750	0.0878	5600	35	47	25	34	40	54	32	43
7/16	14	0.4375	0.1063	6800	50	68	35	47	55	75	45	61
	20	0.4375	0.1187	7550	55	75	40	54	60	82	50	68
1/2	13	0.5000	0.1419	9050	75	102	55	75	85	116	68	92
	20	0.5000	0.1599	10700	90	122	65	88	100	136	80	108
9/16	12	0.5625	0.1820	11600	110	149	80	108	120	163	98	133
	18	0.5625	0.2030	12950	120	163	90	122	135	184	109	148
5/8	11	0.6250	0.2260	14400	150	203	110	149	165	224	135	183
	18	0.6250	0.2560	16300	170	230	130	176	190	258	153	207
3/4	10	0.7500	0.3340	21300	260	353	200	271	285	388	240	325
	16	0.7500	0.3730	23800	300	407	220	298	330	449	268	363
7/8	9	0.8750	0.4620	29400	430	583	320	434	475	646	386	523
	14	0.8750	0.5090	32400	470	637	350	475	520	707	425	576
1	8	1.0000	0.6060	38600	640	868	480	651	675	918	579	785
	12	1.0000	0.6630	42200	700	949	530	719	735	1000	633	858
1 1/8	7	1.1250	0.7630	42300	800	1085	600	813	840	1142	714	968
	12	1.1250	0.8560	47500	880	1193	660	895	925	1258	802	1087
1 1/4	7	1.2500	0.9690	53800	1120	1518	840	1139	1175	1598	1009	1368
	12	1.2500	1.0730	59600	1240	1681	920	1247	1300	1768	1118	1516
1 3/8	6	1.3750	1.1550	64100	1460	1979	1100	1491	1525	2074	1322	1792
	12	1.3750	1.3150	73000	1680	2278	1260	1708	1750	2380	1506	2042
1 1/2	6	1.5000	1.4050	78000	1940	2630	1460	1979	2025	2754	1755	2379
	12	1.5000	1.5800	87700	2200	2983	1640	2224	2300	3128	1974	2676

NO. 5000059 REV. J

- NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
 2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
 3. * ASSEMBLY USES HARDENED WASHER

MY3141



General Information and Specifications

2.2.1 SAE Fastener Torque Chart (Continued)

Values for Zinc Yellow Chromate Fasteners (Ref 4150707)										
SAE GRADE 8 (HEX HD) BOLTS & GRADE 8 NUTS*										
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load	Torque (Dry or Loctite® 263) K= 0.20		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K= 0.18		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604							
	48	0.1120	0.00661							
6	32	0.1380	0.00909							
	40	0.1380	0.01015							
8	32	0.1640	0.01400							
	36	0.1640	0.01474	1320	43	5				
10	24	0.1900	0.01750	1580	60	7				
	32	0.1900	0.02000	1800	68	8				
1/4	20	0.2500	0.0318	2860	143	16	129	15		
	28	0.2500	0.0364	3280	164	19	148	17		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	4720	25	35	20	25	20	25
	24	0.3125	0.0580	5220	25	35	25	35	20	25
3/8	16	0.3750	0.0775	7000	45	60	40	55	35	50
	24	0.3750	0.0878	7900	50	70	45	60	35	50
7/16	14	0.4375	0.1063	9550	70	95	65	90	50	70
	20	0.4375	0.1187	10700	80	110	70	95	60	80
1/2	13	0.5000	0.1419	12750	105	145	95	130	80	110
	20	0.5000	0.1599	14400	120	165	110	150	90	120
9/16	12	0.5625	0.1820	16400	155	210	140	190	115	155
	18	0.5625	0.2030	18250	170	230	155	210	130	175
5/8	11	0.6250	0.2260	20350	210	285	190	260	160	220
	18	0.6250	0.2560	23000	240	325	215	290	180	245
3/4	10	0.7500	0.3340	30100	375	510	340	460	280	380
	16	0.7500	0.3730	33600	420	570	380	515	315	430
7/8	9	0.8750	0.4620	41600	605	825	545	740	455	620
	14	0.8750	0.5090	45800	670	910	600	815	500	680
1	8	1.0000	0.6060	51500	860	1170	770	1045	645	875
	12	1.0000	0.6630	59700	995	1355	895	1215	745	1015
1 1/8	7	1.1250	0.7630	68700	1290	1755	1160	1580	965	1310
	12	1.1250	0.8560	77000	1445	1965	1300	1770	1085	1475
1 1/4	7	1.2500	0.9690	87200	1815	2470	1635	2225	1365	1855
	12	1.2500	1.0730	96600	2015	2740	1810	2460	1510	2055
1 3/8	6	1.3750	1.1550	104000	2385	3245	2145	2915	1785	2430
	12	1.3750	1.3150	118100	2705	3680	2435	3310	2030	2760
1 1/2	6	1.5000	1.4050	126500	3165	4305	2845	3870	2370	3225
	12	1.5000	1.5800	142200	3555	4835	3200	4350	2665	3625

NO. 5000059 REV. J

- NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
 2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
 3. * ASSEMBLY USES HARDENED WASHER

MY3151



2.2.1 SAE Fastener Torque Chart (Continued)

SOCKET HEAD CAP SCREWS										
Magni Coating (Ref 4150701)*										
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load See Note 4	Torque (Dry) K = .17		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140 OR Precoat 85® K=0.16		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
					IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604							
	48	0.1120	0.00661							
6	32	0.1380	0.00909							
	40	0.1380	0.01015							
8	32	0.1640	0.01400							
	36	0.1640	0.01474							
10	24	0.1900	0.01750							
	32	0.1900	0.02000							
1/4	20	0.2500	0.0318	2860	122	14	114	13		
	28	0.2500	0.0364	3280	139	16	131	15		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	4720	20	25	20	25	20	25
	24	0.3125	0.0580	5220	25	35	20	25	20	25
3/8	16	0.3750	0.0775	7000	35	50	35	50	35	50
	24	0.3750	0.0878	7900	40	55	40	55	35	50
7/16	14	0.4375	0.1063	9550	60	80	55	75	50	70
	20	0.4375	0.1187	10700	65	90	60	80	60	80
1/2	13	0.5000	0.1419	12750	90	120	85	115	80	110
	20	0.5000	0.1599	14400	100	135	95	130	90	120
9/16	12	0.5625	0.1820	16400	130	175	125	170	115	155
	18	0.5625	0.2030	18250	145	195	135	185	130	175
5/8	11	0.6250	0.2260	20350	180	245	170	230	160	220
	18	0.6250	0.2560	23000	205	280	190	260	180	245
3/4	10	0.7500	0.3340	30100	320	435	300	410	280	380
	16	0.7500	0.3730	33600	355	485	335	455	315	430
7/8	9	0.8750	0.4620	41600	515	700	485	660	455	620
	14	0.8750	0.5090	45800	570	775	535	730	500	680
1	8	1.0000	0.6060	51500	730	995	685	930	645	875
	12	1.0000	0.6630	59700	845	1150	795	1080	745	1015
1 1/8	7	1.1250	0.7630	68700	1095	1490	1030	1400	965	1310
	12	1.1250	0.8560	77000	1225	1665	1155	1570	1085	1475
1 1/4	7	1.2500	0.9690	87200	1545	2100	1455	1980	1365	1855
	12	1.2500	1.0730	96600	1710	2325	1610	2190	1510	2055
1 3/8	6	1.3750	1.1550	104000	2025	2755	1905	2590	1785	2430
	12	1.3750	1.3150	118100	2300	3130	2165	2945	2030	2760
1 1/2	6	1.5000	1.4050	126500	2690	3660	2530	3440	2370	3225
	12	1.5000	1.5800	142200	3020	4105	2845	3870	2665	3625

NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS

NO. 5000059 REV. J

2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%

*3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM

4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

MY3161



General Information and Specifications

2.2.1 SAE Fastener Torque Chart (Continued)

SOCKET HEAD CAP SCREWS										
Zinc Yellow Chromate Fasteners (Ref 4150707)*										
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load See Note 4	Torque (Dry) K = .20		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140 OR Precoat 85® K=0.18		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604							
	48	0.1120	0.00661							
6	32	0.1380	0.00909							
	40	0.1380	0.01015							
8	32	0.1640	0.01400							
	36	0.1640	0.01474							
10	24	0.1900	0.01750							
	32	0.1900	0.02000							
1/4	20	0.2500	0.0318	2860	143	16	129	15		
	28	0.2500	0.0364	3280	164	19	148	17		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	4720	25	35	20	25	20	25
	24	0.3125	0.0580	5220	25	35	25	35	20	25
3/8	16	0.3750	0.0775	7000	45	60	40	55	35	50
	24	0.3750	0.0878	7900	50	70	45	60	35	50
7/16	14	0.4375	0.1063	9550	70	95	65	90	50	70
	20	0.4375	0.1187	10700	80	110	70	95	60	80
1/2	13	0.5000	0.1419	12750	105	145	95	130	80	110
	20	0.5000	0.1599	14400	120	165	110	150	90	120
9/16	12	0.5625	0.1820	16400	155	210	140	190	115	155
	18	0.5625	0.2030	18250	170	230	155	210	130	175
5/8	11	0.6250	0.2260	20350	210	285	190	260	160	220
	18	0.6250	0.2560	23000	240	325	215	290	180	245
3/4	10	0.7500	0.3340	30100	375	510	340	460	280	380
	16	0.7500	0.3730	33600	420	570	380	515	315	430
7/8	9	0.8750	0.4620	41600	605	825	545	740	455	620
	14	0.8750	0.5090	45800	670	910	600	815	500	680
1	8	1.0000	0.6060	51500	860	1170	775	1055	645	875
	12	1.0000	0.6630	59700	995	1355	895	1215	745	1015
1 1/8	7	1.1250	0.7630	68700	1290	1755	1160	1580	965	1310
	12	1.1250	0.8560	77000	1445	1965	1300	1770	1085	1475
1 1/4	7	1.2500	0.9690	87200	1815	2470	1635	2225	1365	1855
	12	1.2500	1.0730	96600	2015	2740	1810	2460	1510	2055
1 3/8	6	1.3750	1.1550	104000	2385	3245	2145	2915	1785	2430
	12	1.3750	1.3150	118100	2705	3680	2435	3310	2030	2760
1 1/2	6	1.5000	1.4050	126500	3165	4305	2845	3870	2370	3225
	12	1.5000	1.5800	142200	3555	4835	3200	4350	2665	3625

NO. 5000059 REV. J

NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS

2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%

*3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM

4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

MY3400



2.2.2 Mertic Fastener Torque Chart

Values for Zinc Yellow Chromate Fasteners (Ref 4150707)							
CLASS 8.8 METRIC BOLTS CLASS 8 METRIC NUTS							
Size	Pitch	Tensile Stress Area	Clamp Load	Torque (Dry or Loctite® 263™)	Torque (Lub)	Torque (Loctite® 262™ OR Vibra-TITE™ 131)	Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140)
		Sq mm	KN	[N.m]	[N.m]	[N.m]	[N.m]
3	0.5	5.03	2.19	1.3	1.0	1.2	1.4
3.5	0.6	6.78	2.95	2.1	1.6	1.9	2.3
4	0.7	8.78	3.82	3.1	2.3	2.8	3.4
5	0.8	14.20	6.18	6.2	4.6	5.6	6.8
6	1	20.10	8.74	11	7.9	9.4	12
7	1	28.90	12.6	18	13	16	19
8	1.25	36.60	15.9	26	19	23	28
10	1.5	58.00	25.2	50	38	45	55
12	1.75	84.30	36.7	88	66	79	97
14	2	115	50.0	140	105	126	154
16	2	157	68.3	219	164	197	241
18	2.5	192	83.5	301	226	271	331
20	2.5	245	106.5	426	320	383	469
22	2.5	303	132.0	581	436	523	639
24	3	353	153.5	737	553	663	811
27	3	459	199.5	1080	810	970	1130
30	3.5	561	244.0	1460	1100	1320	1530
33	3.5	694	302.0	1990	1490	1790	2090
36	4	817	355.5	2560	1920	2300	2690
42	4.5	1120	487.0	4090	3070	3680	4290

NO. 5000059 REV. J

- NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
 2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = $\pm 10\%$
 *3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM
 4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

MY3171



General Information and Specifications

2.2.2 Metric Fastener Torque Chart (Continued)

Values for Zinc Yellow Chromate Fasteners (Ref 4150707)						
CLASS 10.9 METRIC BOLTS CLASS 10 METRIC NUTS CLASS 12.9 SOCKET HEAD CAP SCREWS M3 - M5*						
Size	PITCH	Tensile Stress Area	Clamp Load	Torque (Dry or Loctite® 263™) K = 0.20	Torque (Lub OR Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K= 0.18	Torque (Loctite® 262™ OR Vibra-TITE™ 131) K=0.15
		Sq mm	KN	[N.m]	[N.m]	[N.m]
3	0.5	5.03	3.13			
3.5	0.6	6.78	4.22			
4	0.7	8.78	5.47			
5	0.8	14.20	8.85			
6	1	20.10	12.5			
7	1	28.90	18.0	25.2	22.7	18.9
8	1.25	36.60	22.8	36.5	32.8	27.4
10	1.5	58.00	36.1	70	65	55
12	1.75	84.30	52.5	125	115	95
14	2	115	71.6	200	180	150
16	2	157	97.8	315	280	235
18	2.5	192	119.5	430	385	325
20	2.5	245	152.5	610	550	460
22	2.5	303	189.0	830	750	625
24	3	353	222.0	1065	960	800
27	3	459	286.0	1545	1390	1160
30	3.5	561	349.5	2095	1885	1575
33	3.5	694	432.5	2855	2570	2140
36	4	817	509.0	3665	3300	2750
42	4.5	1120	698.0	5865	5275	4395

NO. 5000059 REV. J

- NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
 2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
 *3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM
 4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

MY3181



2.2.2 Mertic Fastener Torque Chart (Continued)

Magni Coating (Ref 4150701)*						
CLASS 12.9 SOCKET HEAD CAP SCREWS M6 AND ABOVE*						
Size	PITCH	Tensile Stress Area	Clamp Load See Note 4	Torque (Dry or Loctite® 263™) K = .17	Torque (Lub OR Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K = .16	Torque (Loctite® 262™ OR Vibra-TITE™ 131) K = .15
		Sq mm	kN	[N.m]	[N.m]	[N.m]
3	0.5	5.03				
3.5	0.6	6.78				
4	0.7	8.78				
5	0.8	14.20				
6	1	20.10	12.5	13	12	11
7	1	28.90	18.0	21	20	19
8	1.25	36.60	22.8	31	29	27
10	1.5	58.00	36.1	61	58	54
12	1.75	84.30	52.5	105	100	95
14	2	115	71.6	170	160	150
16	2	157	97.8	265	250	235
18	2.5	192	119.5	365	345	325
20	2.5	245	152.5	520	490	460
22	2.5	303	189.0	705	665	625
24	3	353	220.0	900	845	790
27	3	459	286.0	1315	1235	1160
30	3.5	561	349.5	1780	1680	1575
33	3.5	694	432.5	2425	2285	2140
36	4	817	509.0	3115	2930	2750
42	4.5	1120	698.0	4985	4690	4395

NO. 5000059 REV. J

- NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
 2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT
 METHODS TOLERANCE = ±10%
 *3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED
 STEEL OR RAW ALUMINUM
 4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT
 REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED,
 ADDITIONAL TESTING IS REQUIRED.

MY3191



General Information and Specifications

2.2.3 Hydraulic Hose Torque Chart

O-Ring Face Seal & JIC Torque Chart

Size	ORFS	JIC	Flats Method
4	13 lb-ft (18 Nm)	13 lb-ft (18 Nm)	1.5 to 1.75
6	23 lb-ft (31 Nm)	23 lb-ft (31 Nm)	1 to 1.5
8	40 lb-ft (54 Nm)	40 lb-ft (54 Nm)	1.5 to 1.75
10	60 lb-ft (81 Nm)	60 lb-ft (81 Nm)	1.5 to 1.75
12	74 lb-ft (100 Nm)	85 lb-ft (115 Nm)	1.0 to 1.5
16	115 lb-ft (156 Nm)	115 lb-ft (156 Nm)	0.75 to 1.0
20	170 lb-ft (230 Nm)	170 lb-ft (230 Nm)	0.75 to 1.0
24	200 lb-ft (271 Nm)	200 lb-ft (271 Nm)	0.75 to 1.0
32	N/A	270 lb-ft (366 Nm)	0.75 to 1.0

Note: By definition the "Flats Method" will contain some variance. Use the "Flats Method" only when accessibility with a torque wrench is not possible.

Torque Wrench:

1. Identify the appropriate application and refer to the above chart for the correct torque value.
2. If equipped, lubricate o-ring with hydraulic oil. Hand tighten the swivel nut until no lateral movement of the swivel nut can be detected. Average hand torque is 3 lb-ft (4 Nm).
3. Use the double wrench method while tightening to avoid hose twist.
4. Torque wrench must be held at the center of the grip. Apply constant force until it clicks.
5. After the connection has been properly tightened, mark a straight line across the connecting parts indicating that the connection has been properly tightened.

Flats Method:

1. If equipped, lubricate o-ring with hydraulic oil. Hand tighten the swivel nut until no lateral movement of the swivel nut can be detected. Average hand torque is 3 lb-ft (4 Nm).
2. Mark a dot on one of the swivel nut flats and another dot in line on the hex of the adapter it's connecting to.
3. Use the double wrench method while tightening to avoid hose twist.
4. After the connection has been properly tightened, mark a straight line across the connecting parts, not covering the dots indicating that the connection has been properly tightened.



2.3 SPECIFICATIONS

2.3.1 Travel Speeds

	6036 & 6042	8042, 10042 & 10054
First Gear	3.5 mph (5,6 km/hr)	3.5 mph (5,6 km/hr)
Second Gear	5.5 mph (9,7 km/hr)	6 mph (9,7 km/hr)
Third Gear	13.5 mph (22 km/hr)	14 mph (23 km/hr)
Fourth Gear	20 mph (32 km/hr)	20 mph (32 km/hr)

2.3.2 Hydraulic Cylinder Performance

Note: Machine with no attachment or load, engine at full throttle, hydraulic oil above 130° F (54° C) minimum, engine at operating temperature.

FUNCTION	APPROXIMATE TIMES (seconds)				
	6036	6042	8042	10042	10054
Boom Extend	Less than 15.0	Less than 19.0	Less than 19.0	Less than 19.0	Less than 19.0
Boom Retract	Less than 15.0	Less than 19.0	Less than 17.0	Less than 17.0	Less than 17.0
Boom Lift Retracted	Less than 15.0	Less than 17.0	Less than 17.5	Less than 17.5	Less than 17.5
Boom Lower Retracted	Less than 10.0	Less than 13.0	Less than 15.5	Less than 15.5	Less than 15.5
Attachment Tilt - Up	4.0-6.0	6.5	Less than 8.0	Less than 8.0	Less than 8.0
Attachment Tilt - Down	3.5-5.5	6.0	Less than 11.0	Less than 11.0	Less than 11.0
Frame Sway Left to Right with Boom Down	3.0-6.0	12.0-15.0	5.5-12.0	5.5-12.0	3-6
Frame Sway Left to Right with Boom Above 40° and Emergency Brake Engaged	—	23.0-30.3	23.0-33.0	23.0-33.0	23.0-33.0
Frame Sway Right to Left with Boom Down	4.0-8.0	12.0-15.0	4.0-8.0	4.0-8.0	4.0-8.0
Frame Sway Right to Left with Boom Above 40° and Emergency Brake Engaged	—	26.0-52.0	26.0-52.0	26.0-52.0	26.0-52.0
Outrigger - Left or Right, UP or DOWN	—	—	—	4.0-9.0	4.0-9.0
Outrigger - Left and Right, UP or DOWN	—	—	—	4.0-10.0	4.0-10.0



General Information and Specifications

2.3.3 Electrical System

Battery	
Type, Rating	12 BCI, Negative (-) Ground, Maintenance Free
Quantity	3.3 Liter - 1, 4.5 Liter - 2
Reserve Capacity	3.3 Liter - 700 Cold Cranking Amps @ 0° F (-18° C) 4.5 Liter - 900 Cold Cranking Amps @ 0° F (-18° C)
Group/Series	Group 31
Alternator (6036 & 6042)	12V, 120 Amps
Alternator (8042, 10042 & 10054)	12V, 100 Amps

2.3.4 Engine Performance Specifications

Description	6036 & 6042
Engine Make/Model	Cummins QSB3.3
Displacement	201 in ³ (3,3 liters)
Low Idle	1100 rpm
High Idle	2600 rpm
Horsepower	99 hp (74 Kw) @ 2600 rpm
Peak Torque	306 lb-ft (415 Nm) @ 1600 rpm
Fuel Delivery	Fuel Injection
Air Cleaner	Dry Type, Replaceable Primary and Safety Elements

Description	8042, 10042 & 10054 (Before S/N 0160040220 excluding 0160039850, 0160040126, 0160040129 & 0160040171)
Engine Make/Model	Cummins QSB4.5
Displacement	274 in ³ (4,5 liters)
Low Idle	1000 rpm
High Idle	2500 rpm
Horsepower	110 hp (82 Kw) @ 2500 rpm
Peak Torque	360 lb-ft (488 Nm) @ 1500 rpm
Fuel Delivery	Fuel Injection
Air Cleaner	Dry Type, Replaceable Primary and Safety Elements



Description	8042, 10042 & 10054 (S/N 0160040220 & After including 0160039850, 0160040126, 0160040129 & 0160040171)
Engine Make/Model	Cummins QSB3.3
Displacement	274 in ³ (4,5 liters)
Low Idle	900 rpm
High Idle	2400 rpm
Horsepower	110 hp (82 Kw) @ 2400 rpm
Peak Torque	306 lb-ft (415 Nm) @ 1600 rpm
Fuel Delivery	Fuel Injection
Air Cleaner	Dry Type, Replaceable Primary and Safety Elements

2.3.5 Tires

Note: Standard wheel lug nut torque is 430 - 470 lb-ft (583 - 637 Nm).

Note: Pressure for foam filled tires are for initial fill ONLY.

a. 6036

Size	Tire Type	Minimum Ply/ Star Rating	Fill Type	Pressure
13.0 x 24	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	55 psi (3,8 bar)
			Foam - Approx 542 lb (246 kg)	65 psi (4,5 bar)
13.0 x 24	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	55 psi (3,8 bar)
			Foam - Approx 542 lb (246 kg)	65 psi (4,5 bar)
13.0 R 24	G-2/L-2 Radial	1 Star	Pneumatic	55 psi (3,8 bar)
			Foam - Approx 542 lb (246 kg)	75 psi (5,2 bar)
15.5 x 25	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	55 psi (3,8 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 x 25	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	55 psi (3,8 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 R 25	G-2/L-2 Radial	1 Star	Pneumatic	58 psi (3,9 bar)
			Foam - Approx 600 lb (272 kg)	73 psi (5,0 bar)
370/75x28	DuraForce	14 Ply	Pneumatic	76 psi (5,2 bar)
			Foam-Approx 464 lb (210 kg)	73 psi (5,0 bar)



General Information and Specifications

b. 6042

Size	Tire Type	Minimum Ply/ Star Rating	Fill Type	Pressure
13.0 x 24	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 542 lb (246 kg)	65 psi (4,5 bar)
13.0 x 24	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 542 lb (246 kg)	65 psi (4,5 bar)
13.0 R 24	G-2/L-2 Radial	1 Star	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 542 lb (246 kg)	65 psi (4,5 bar)
15.5 x 25	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	65 psi (4,5 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 x 25	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	65 psi (4,5 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 R 25	G-2/L-2 Radial	1 Star	Pneumatic	65 psi (4,5 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
370/75x28	DuraForce	14 Ply	Pneumatic	76 psi (5,2 bar)
			Foam-Approx 464 lb (210 kg)	73 psi (5,0 bar)

**c. 8042**

Size	Tire Type	Minimum Ply/ Star Rating	Fill Type	Pressure
15.5 x 25	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 x 25	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 600 lb (272 kg)	58 psi (3,9 bar)
15.5 R 25	G2/L-2 Radial	1 Star	Pneumatic	70 psi (4,8 bar)
			Foam - Approx 600 lb (272 kg)	73 psi (5,0 bar)
370/75x28	DuraForce	14 Ply	Pneumatic	76 psi (5,2 bar)
			Foam-Approx 464 lb (210 kg)	73 psi (5,0 bar)

d. 10042 & 10054

Size	Tire Type	Minimum Ply/ Star Rating	Fill Type	Pressure
17.50 x 25	G-2/L-2 Bias Ply Traction	12 Ply	Pneumatic	60 psi (4,1 bar)
			Foam - Approx 785 lb (356 kg)	51 psi (3,5 bar)
17.50 x 25	G-3/L-3 Bias Ply Rock	12 Ply	Pneumatic	60 psi (4,1 bar)
			Foam - Approx 785 lb (356 kg)	51 psi (3,5 bar)
17.50 x 25	G-2/L-2 Radial	1 Star	Pneumatic	73 psi (5,0 bar)
			Foam - Approx 785 lb (356 kg)	73 psi (5,0 bar)
370/75x28	DuraForce	14 Ply	Pneumatic	76 psi (5,2 bar)
			Foam-Approx 464 lb (210 kg)	73 psi (5,0 bar)



General Information and Specifications

2.4 FLUID AND LUBRICANT CAPACITIES

Engine Crankcase Oil

Capacity with Filter Change	
Cummins QSB3.3	7.6 quart (7,2 liter)
Cummins QSB4.5	11.0 quart (10,4 liter)
Type of Oil	15W-40 CH

Fuel Tank

Capacity	37 gallon (140 liter)
Type of Fuel	#2 Diesel

Cooling System

System Capacity	
Cummins QSB3.3	6.3 gallon (23,8 liter)
Cummins QSB4.5	5.0 gallon (18,9 liter)
Overflow Bottle Capacity	3 quart (2,8 liter)
Type of Fluid	50/50 ethylene glycol & water

Hydraulic System

System Capacity	
6036 & 6042	57 gallon (216 liter)
8042	58 gallon (218 liter)
10042 & 10054	64 gallon (242 liter)
Reservoir Capacity to Full Mark	32 gallon (122 liter)
Type of Fluid	Mobilfluid 424® Tractor Hydraulic Fluid

Transmission

Capacity with Filter Change	4.8 gallon (13,6 liter)
Filter	1.5 quart (1,4 liter)
Type of Fluid	Mobilfluid 424® Tractor Hydraulic Fluid

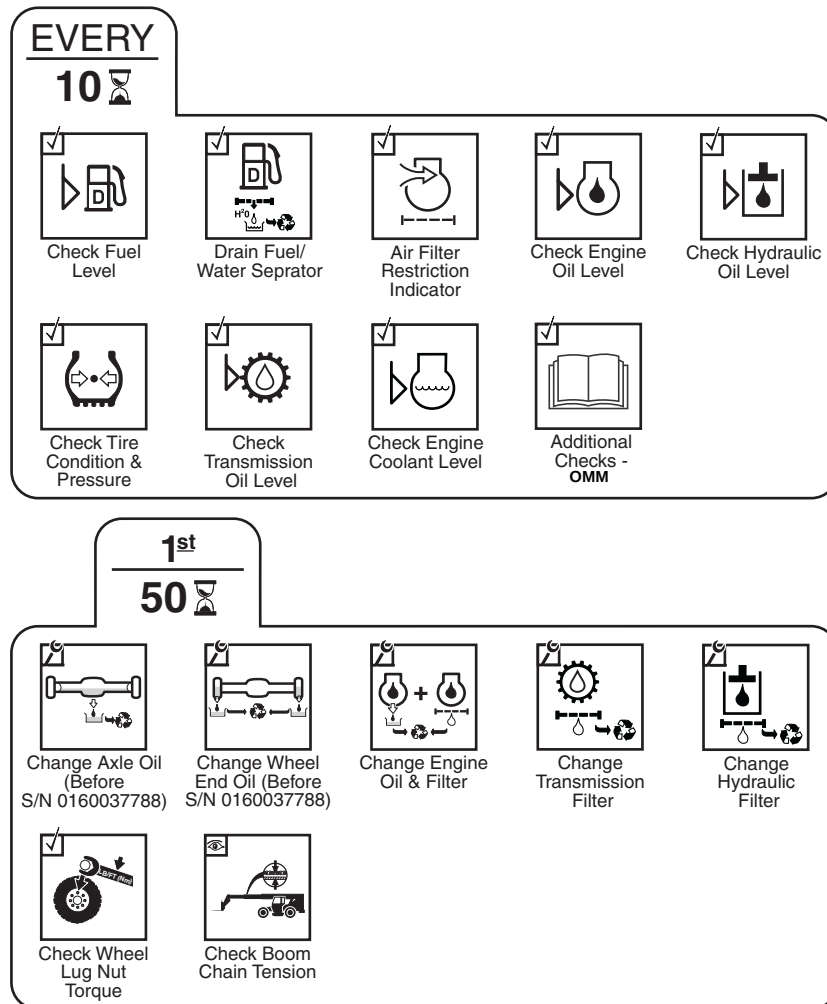
**Axles**

8042 Before S/N 0160038967 including 0160038971 10042 Before S/N 0160038368 including 0160038375, 0160038378, 0160038379, 0160038381 & 0160038383 10054 Before S/N 0160038740 excluding 0160021270, 0160036713, 0160036715 & 0160036723	
Differential Housing Capacity	
Front Axle	9.5 quart (9 liter)
Rear Axle	10.6 quart (10 liter)
Wheel End Capacity	
Front Axle	1.7 quart (1,6 liter)
Rear Axle	1.3 quart (1,2 liter)
Type of Fluid	Mobilfluid 424® Tractor Hydraulic Fluid
6036 & 6042 8042 S/N 0160038967 & After excluding 0160038971 10042 S/N 0160038368 & After excluding 0160038375, 0160038378, 0160038379, 0160038381 & 0160038383 10054 S/N 0160038740 & After including 0160021270, 0160036713, 0160036715 & 0160036723	
Differential Housing Capacity	
12.5 quart (11,8 liter)	
Wheel End Capacity	
Front Axle	2.1 quart (2,0 liter)
Rear Axle	2.2 quart (2,1 liter)
Type of Fluid	Mobilfluid 424® Tractor Hydraulic Fluid



2.5 SERVICE AND MAINTENANCE SCHEDULES

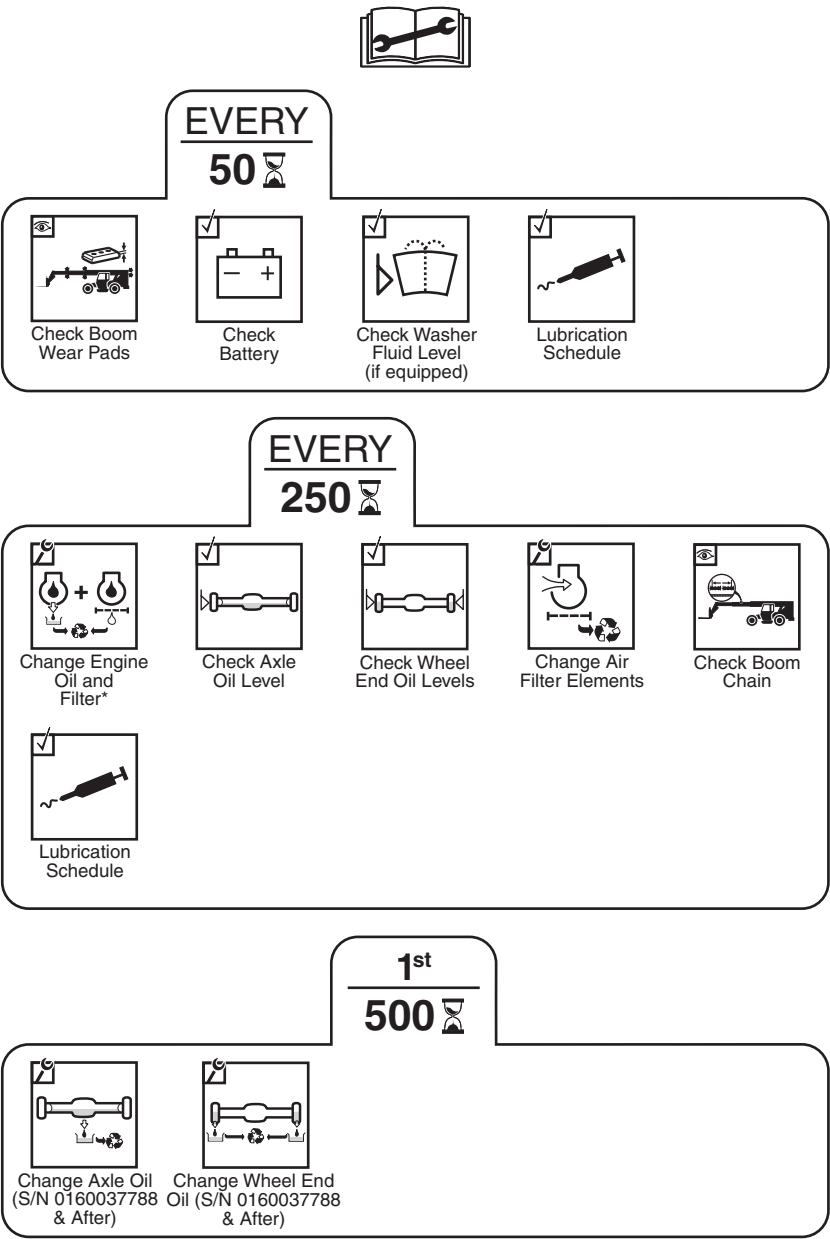
2.5.1 10 & 1st 50 Hour



OH4132



2.5.2 50, 250 & 1st 500 Hour



OH4142

Note: Engine oil and filter service interval can be extended. See Engine Manual for details.



General Information and Specifications

2.5.3 500 & 1000 Hour



EVERY
500 

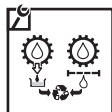


Change Fuel
Filter & Strainer

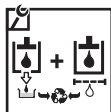


Check Wheel
Lug Nut
Torque

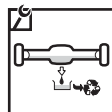
EVERY
1000 



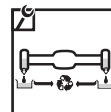
Change
Transmission
Oil & Filter



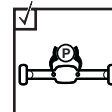
Change
Hydraulic
Fluid & Filters



Change
Axle Oil



Change Wheel
End Oil



Check Axle
Brake Discs



Check Boom
Chain Tension



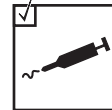
Check Boom
Wear Pads



Check
Fan Belt



Check Air
Intake System



Lubrication
Schedule

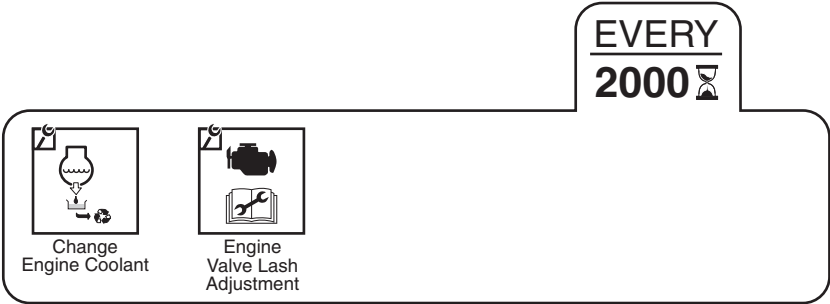


Lubricate
Boom Chain

OH4152



2.5.4 2000 Hour



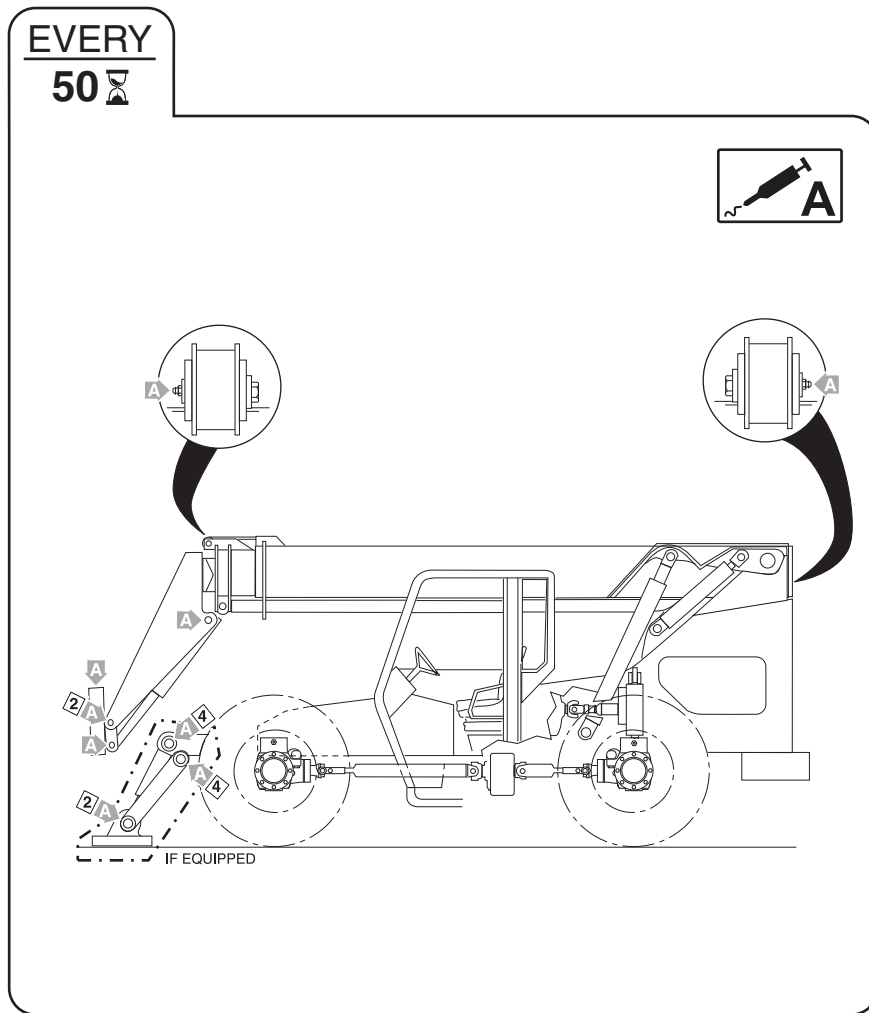
OH4601

Note: Valve Lash adjustment for QSB 3.3 engine ONLY. See Engine Manual for details.



2.6 LUBRICATION SCHEDULES

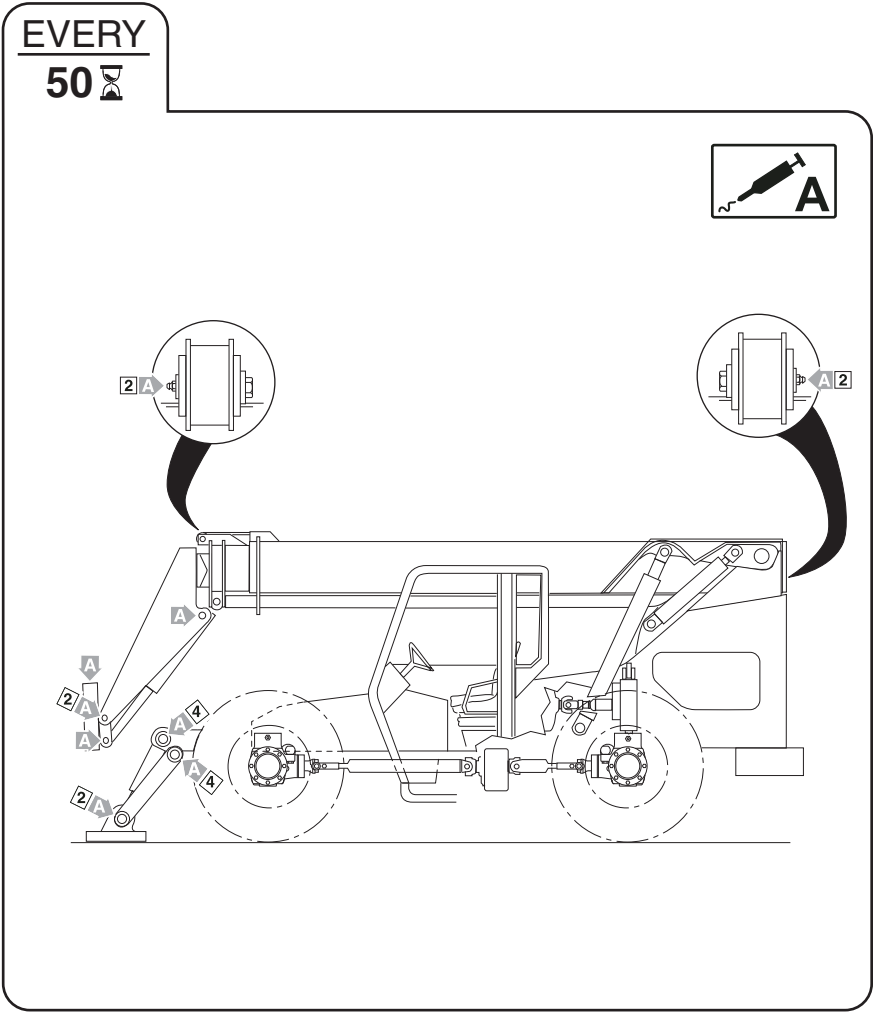
a. 50 Hour (6036, 6042, 8042 & 10042)



OH4162



b. 50 Hour (10054)



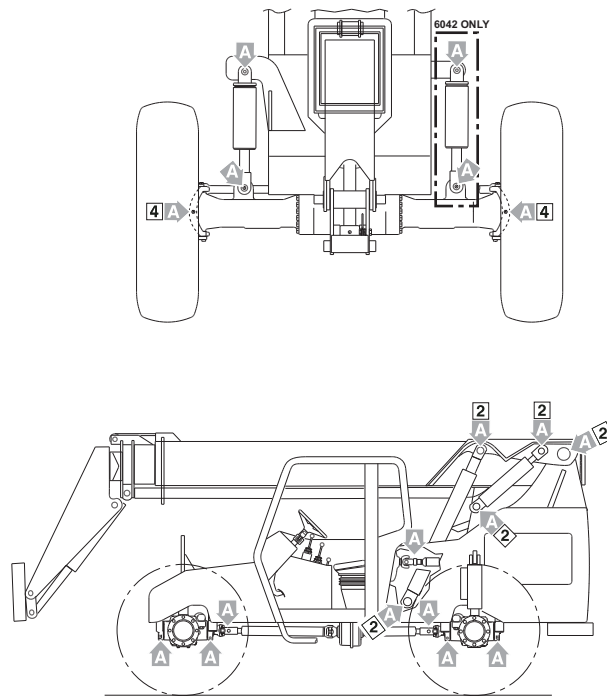
OH4242



General Information and Specifications

c. 250 Hour (6036 & 6042)

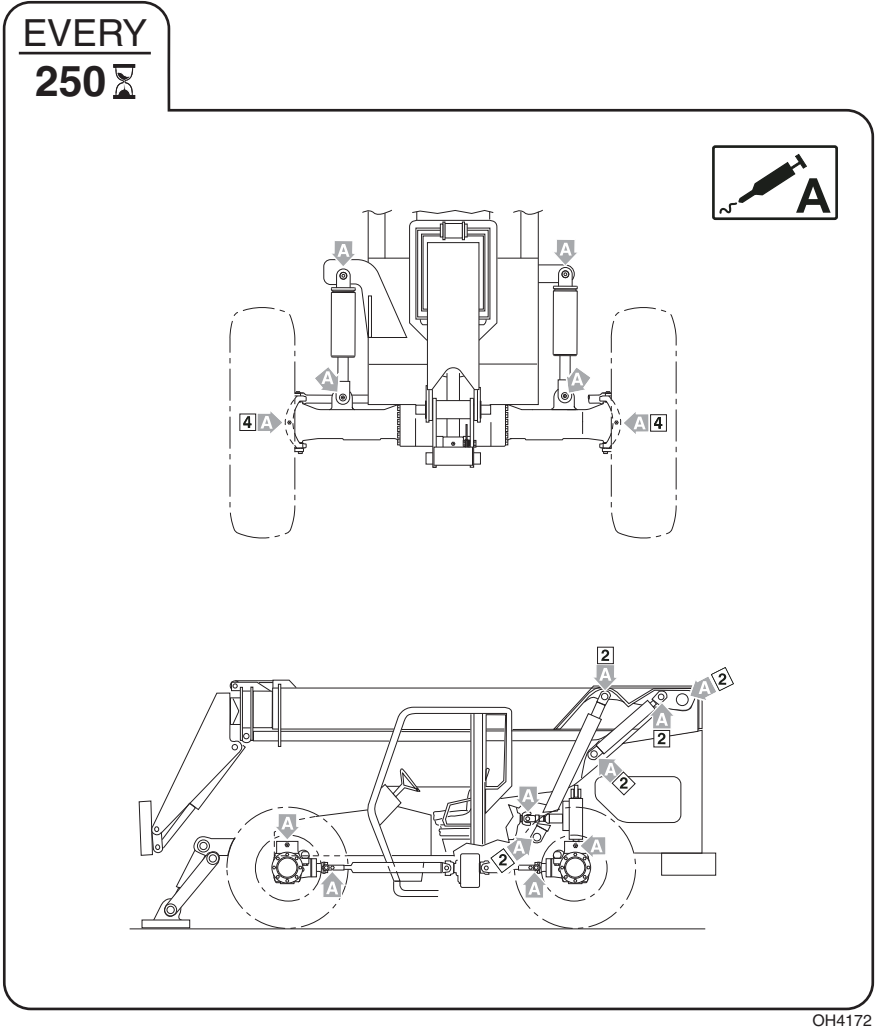
EVERY
250 ⌚



OA1820



d. 250 Hour (8042, 10042 & 10054)

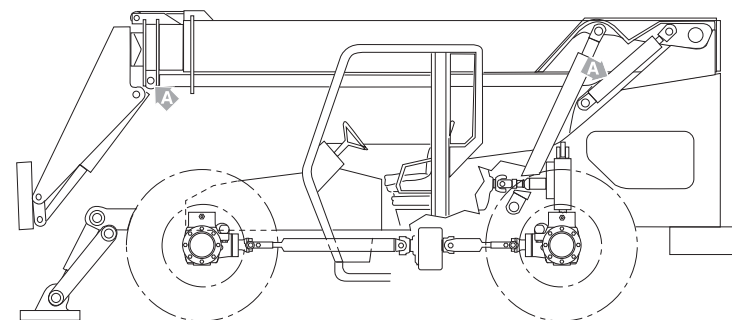




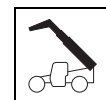
General Information and Specifications

e. 1000 Hour

EVERY
1000 



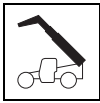
OH4181



Section 3 Boom

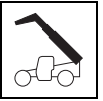
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Boom

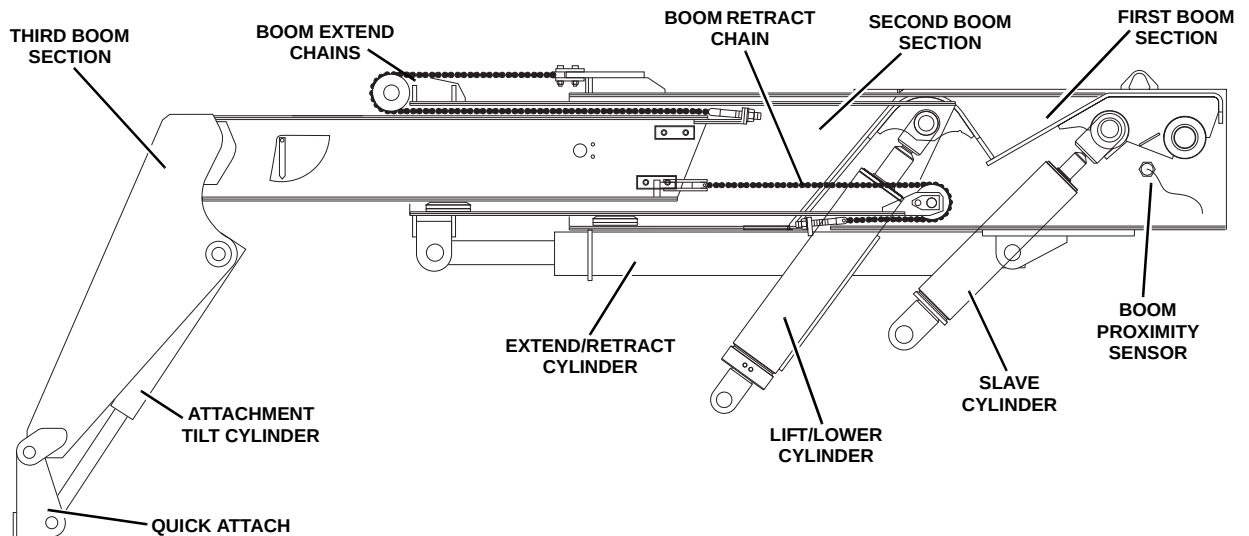
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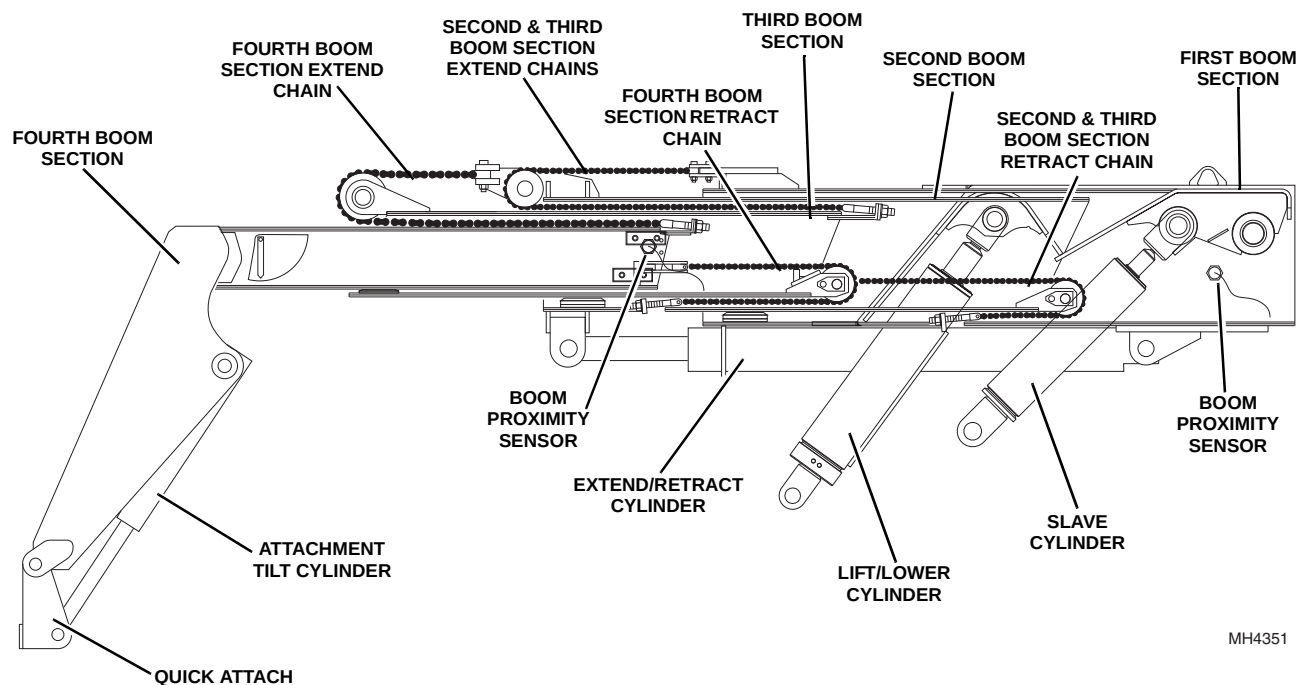
3.1 BOOM SYSTEM COMPONENT TERMINOLOGY

The following illustrations identify the components that are referred to throughout this section.

THREE SECTION BOOM (6036, 6042, 8042 & 10042)



FOUR SECTION BOOM (10054)



MH4351



Boom

3.2 SAFETY INFORMATION



WARNING

DO NOT service the machine without following all safety precautions as outlined in the "Safety Practices" section of this manual.



WARNING

NEVER weld or drill the boom unless approved in writing by the manufacturer. The structural integrity of the boom will be impaired if subjected to any repair involving welding or drilling.

3.3 BOOM SYSTEM - THREE SECTION (6036, 6042, 8042 & 10042)

3.3.1 Boom System Operation

The three section boom assembly consists of first, second and third boom section assemblies with double top boom extend chains and a single retract chain. Boom extension and retraction is accomplished via hydraulic power and chain movement.

As the Extend/Retract hydraulic cylinder, which is anchored at the rear of the second boom section and the rear of the first boom section, begins to extend, it forces the second boom section out of the first boom section.

The second and third boom sections are connected by extend and retract chains. These chains are routed around sheaves on the second boom section. As the second boom section is forced out, the extend chain pulls the third boom section out of the second boom section.

As hydraulic pressure is applied to the retract port on the Extend/Retract cylinder, the second boom section is pulled back into the first boom section, and retract chain pulls the third boom section back into the second section.

This mechanical linkage formed by the chains and supporting hardware extends and retracts the second and third boom sections at the same rate.

The first boom section does not extend or retract, but lifts and lowers via action of the lift/lower cylinder.

3.4 BOOM ASSEMBLY MAINTENANCE

These instructions must be completed in sequence. The third boom section must be removed before removing the second boom section. The third and second boom section must be removed at one time before removing the first boom section.

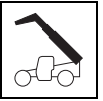
Before beginning, conduct a visual inspection of the machine and work area, and review the task about to be undertaken. Read, understand and follow these instructions.

3.4.1 Boom Removal

1. Remove any attachment from the quick attach assembly. Refer to Section 3.8.1, "Disconnecting from an Attachment."

Note: If replacing the third section boom, remove the quick attach from the third section. Refer to Section 3.8.3, "Quick Attach Removal."

2. Park the machine on a hard, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
3. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
4. Open the rear door. Allow the system fluids to cool.
5. Move the Attachment Tilt joystick in both directions to relieve any trapped pressure in the Attachment Tilt system. If the machine is equipped with Auxiliary controls, move the Auxiliary hydraulic joystick in both directions to relieve any trapped pressure in the Auxiliary hydraulic system.
6. Properly disconnect the battery.
7. Label, disconnect and cap the hydraulic hoses at the rear of the boom. Cap all fittings to keep dirt and debris from entering the hydraulic system.
8. Label and disconnect the boom proximity sensor at the rear of the boom.
9. Remove the pin from the rod end of the slave cylinder being careful not to drop the cylinder. Lower the cylinder onto the frame rails.
10. Remove the pin from the rod end of the lift/lower cylinders. Lower the cylinders onto the frame rails.
11. Confirm that the boom assembly is balanced with the sling and remove the boom assembly pivot pin.
12. Lift the boom assembly from the machine and lower onto suitable supports

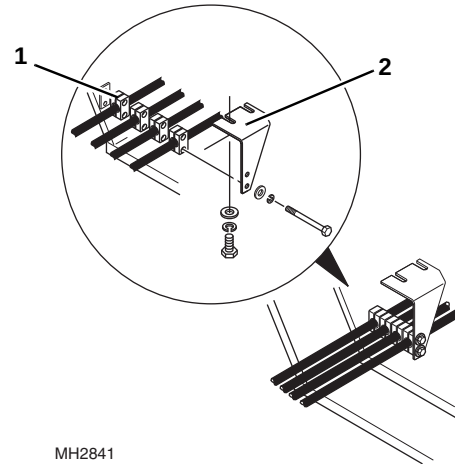


3.4.2 Third Boom Section Removal

1. Remove any attachment from the quick attach assembly. Refer to Section 3.8.1, "Disconnecting from an Attachment."

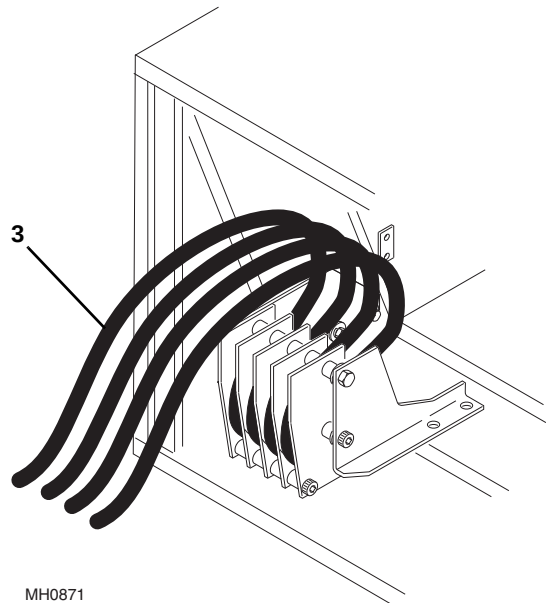
Note: If replacing the third section boom, remove the quick attach from the third section. Refer to Section 3.8.3, "Quick Attach Removal."

2. Park the machine on a hard, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
3. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
4. Open the rear door. Allow the system fluids to cool.
5. Move the Attachment Tilt joystick in both directions to relieve any trapped pressure in the Attachment Tilt system. If the machine is equipped with Auxiliary controls, move the Auxiliary hydraulic joystick in both directions to relieve any trapped pressure in the Auxiliary hydraulic system.
6. Label, disconnect and cap the hoses attached to the Attachment Tilt cylinder. Cap all fittings to keep dirt and debris from entering the hydraulic system.
7. If the machine is equipped with Auxiliary hydraulics, label, cap and remove the hoses from the bulkhead fittings.
8. If replacing the third boom section with a new boom section: Remove the female coupler, male nipple and bulkhead fittings from the bulkhead plate inside the boom head.
9. Remove the rear cover from the boom.
10. If equipped with Auxiliary hydraulics, inside the third boom section, loosen, but DO NOT remove the capscrews securing the left side wear pad and hose clamp support bracket to the top of the third boom section.



MH2841

11. Remove the stack clamps (1) and hose clamp support bracket (2) to the left side of the third boom section.

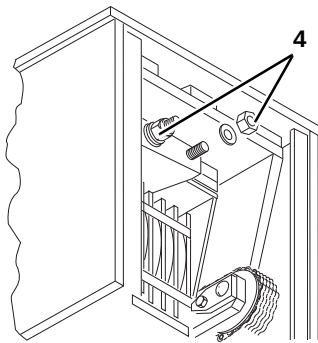


MH0871

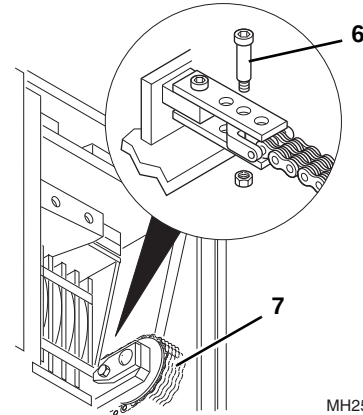
12. Pull the free ends of the hydraulic hoses (3) from the inside the third boom section and out of the rear of the boom. Allow the hoses to hang from the rear of the boom.
13. Remove the top and side wear pads and spacers to the inside of the second boom section. Label and tag each set of wear pads being removed.



Boom

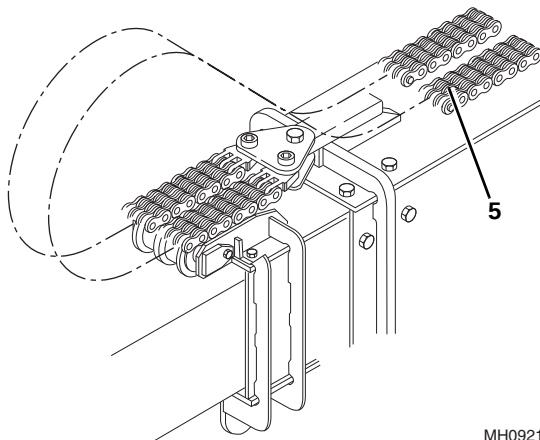


MH0912



MH2551

14. At the rear of the boom, measure the amount of threads protruding beyond each locknut (4) and record the measurement for reassembly. Remove the two locknuts and flat washers holding both extend chain clevis' to the anchor plate on the first boom section.



MH0921

15. At the front of the second boom section, pull both extend chains (5) out from between the second and third boom sections. The extend chains can remain anchored between the yoke plates on the first boom section. Loop both chains over the top of the chain sheave and lay the chains on top of the boom.

Note: Record the location of the shoulder bolt (6) to ensure correct installation.

16. At the rear of the boom, locate the retract chain (7) on the right side of the boom. In front of the retract chain sheave, locate the shoulder bolt which holds the retract chain to the anchor plates on the third boom section. Remove the locknut from the shoulder bolt. Allow the retract chain to hang out the rear of the boom.

Note: If replacing the third boom section with a new boom section, the quick attach assembly and the Attachment Tilt cylinder should be removed at this time. Refer to Section 3.8.3, "Quick Attach Removal."

If the third boom section is not to be replaced, the quick attach assembly and Attachment Tilt cylinder can remain in place.

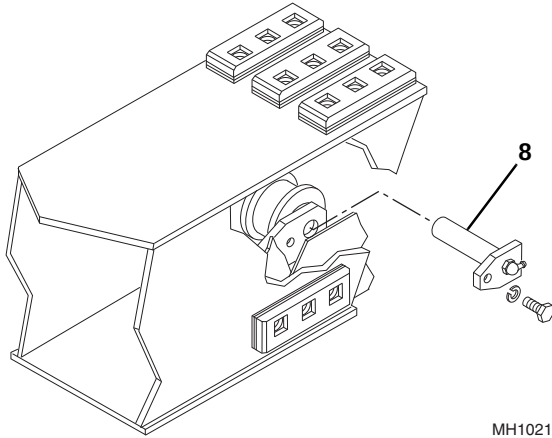
17. Using a sling or suitable support, pull the third boom section straight out of the second boom section. Reposition the slings as needed so the third boom section balances when removed from the second boom section. Set the boom section down on a hard, level surface. Support the boom as needed to prevent it from tipping over.
18. At the rear of the third boom section, remove the remaining wear pads, shims and hardware. Label and tag each set of wear pads being removed.
19. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."

3.4.3 Second Boom Section Removal

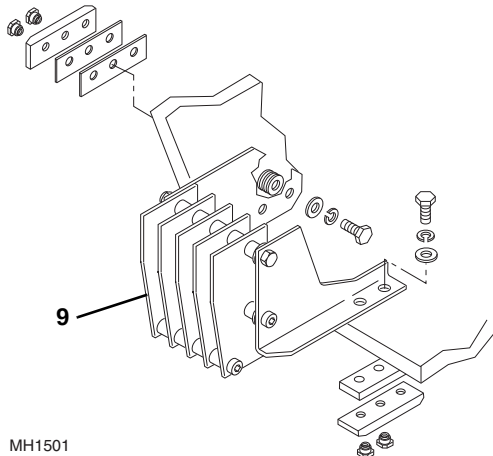
1. At the front of the first boom section, remove the top, bottom and side wear pads to the inside of the boom. Label and tag each set of wear pads being removed.



2. Remove the capscrews and lockwashers holding the center wear pad spacer mount to the front of the first boom section. Label and tag each set of wear pads being removed.

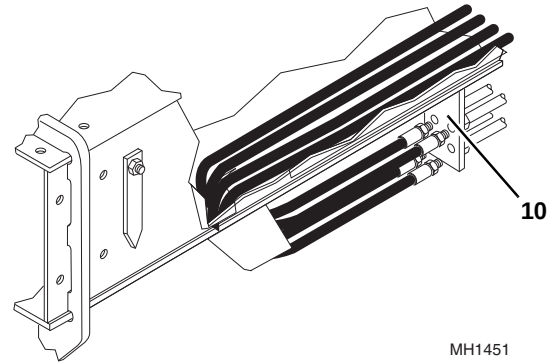


3. At the rear of the second boom section, remove the capscrew and lockwasher holding the retract chain sheave pin (8) to the mounting plate inside the boom.
4. Remove the retract chain sheave pin from the mount and the retract chain sheave. Remove the retract chain sheave from the second boom section.
5. Inspect the bushings inside the sheave. Replace the bushings if there are any signs of wear. Inspect the pin for wear or damage. Replace the pin if showing signs of wear.

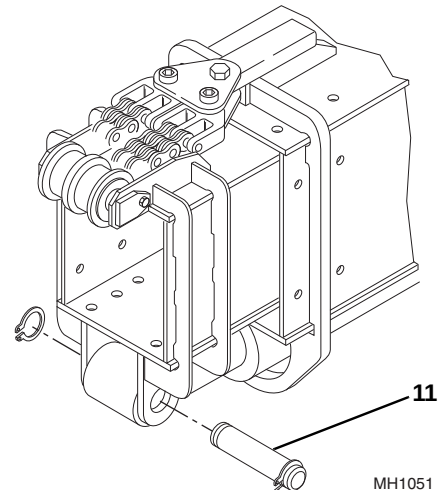


6. At the rear of the second boom section, remove the hose reel assembly (9), lower wear pad and spacer. Reassemble the capscrews, lockwashers and flat washers to hold the lower wear pad in place for second boom section removal.
7. Remove hose reel side plate, lower left side wear pad and shims. Label and tag each set of wear pads being removed.

8. Pull the hose reel, with hoses, out the back of the second boom section. Allow the hose reel assembly to slide down the hoses and rest it on the floor.
9. Label and remove the hoses from the hose reel. The center bolt can remain in place to hold the hose reel and side plates together.



10. Label, disconnect and cap the hydraulic hoses from the bottom tube assemblies at the mounting plate (10).
11. Pull the hose ends out from between the second and first boom sections and out the rear of the boom.
12. Using a suitable sling or support, secure the front of the Extend/Retract cylinder.

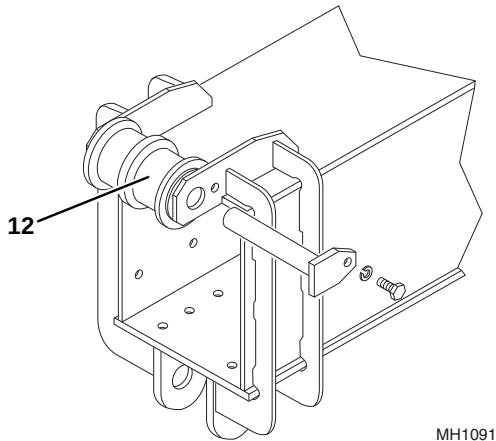


13. Remove the retaining ring from one side of the Extend/Retract cylinder rod end mounting pin (11).
14. Using a sling or suitable support, pull the second boom section straight out of the first boom section. Reposition the slings as needed so the second boom section balances when removed from the first boom section. Set the second boom section down on blocks on a hard, level surface.
15. Remove the remaining wear pads. Label and tag each set of wear pads being removed.



Boom

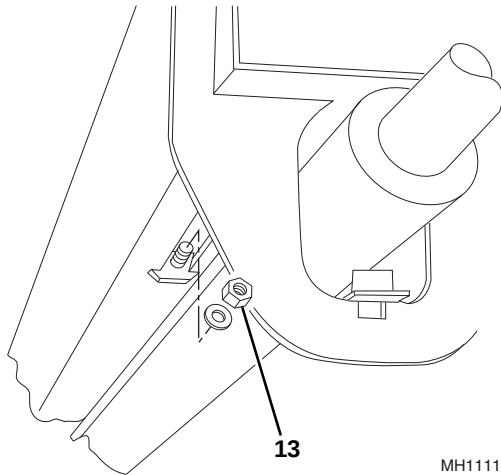
16. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."



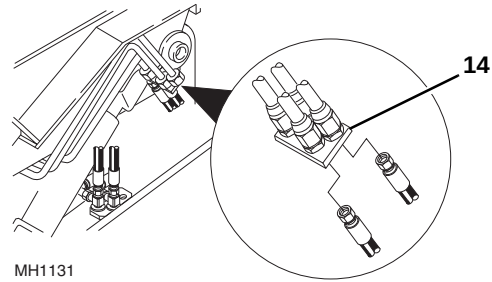
17. Remove the extend chain sheave (12).

3.4.4 First Boom Section Removal

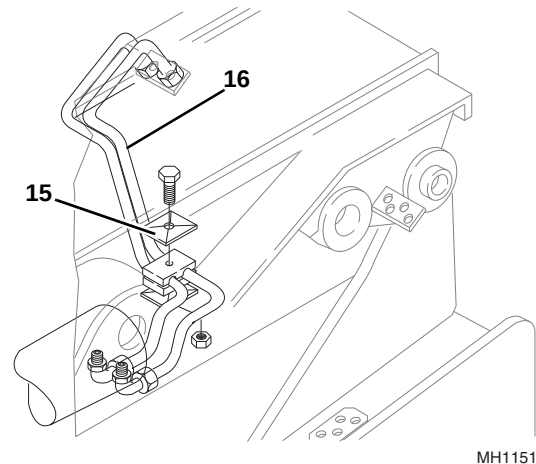
1. Use a suitable overhead lifting device and sling attached to the Lift/Lower cylinder; remove slack from the sling.



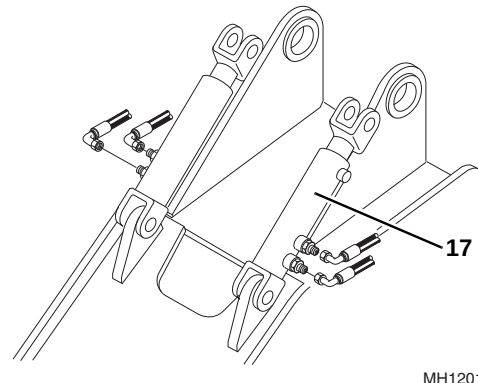
2. At the underside of the boom, locate the retract chain locknut (13). Measure the amount of threads protruding beyond the locknut and record that measurement for reassembly of the chain. Remove the locknut and flat washer.
3. Remove the retract chain by pulling it out through the rear of the boom. Place the retract chain on a clean surface.



4. Label, disconnect and cap the hydraulic hoses from the bulkhead fittings on the mounting plate (14). Remove the tubes from the bulkhead fittings.
5. At the rear right side of the boom, label, disconnect and cap the boom Extend/Retract hoses from the bulkhead fittings on the mounting plate. Cap the fittings to keep dirt and debris from entering the hydraulic system.

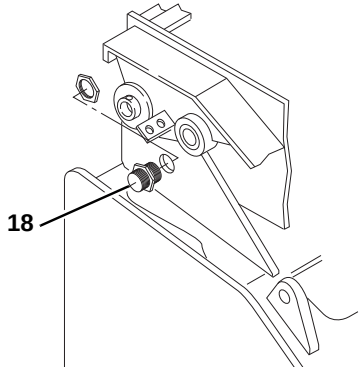


6. Remove the tube clamps (15) and clamp covers to the Extend and Retract tubes under the boom.
7. At the rear right side of the boom, label, disconnect and cap the Extend and Retract tubes (16) from the bulkhead fittings. Cap the fittings to keep dirt and debris from entering the hydraulic system.



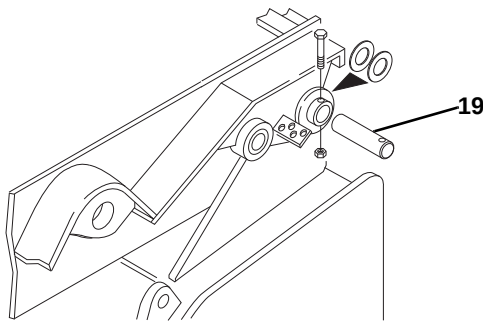


8. Label, disconnect and cap the hydraulic hoses attached to both slave cylinders (17). Cap all fittings to keep dirt and debris from entering the hydraulic system.
9. Support the slave cylinder on the right side of the machine. Remove the rod end pins securing the cylinder in position. Move the cylinder to a clean, flat surface. Repeat this procedure for the left side slave cylinder.



MH1221

10. Remove the boom proximity sensor (18) from the right side boom pivot mounting plate.
11. Securely block up or support the right Lift/Lower cylinder. Remove the rod end pin. Repeat this procedure for the left Lift/Lower cylinder.



MH1241

12. Remove the boom pivot pins (19) to the frame. While removing the pins, note the location and quantity of shims between the outer boom and frame.
13. Using a sling or suitable support, carefully lift the first boom section away from the machine. Set the boom section down on a hard, level surface. Support the boom as required to allow removal of the Extend/Retract cylinder from the underside of the boom.
14. Use a hoist and slings to support the Extend/Retract cylinder. At the base end of the cylinder, remove a retaining ring from one side of the cylinder base end pin.

15. Lower the base end of the Extend/Retract cylinder and remove the rod end of the cylinder from the retainer at the front of the boom. Place the Extend/Retract cylinder on a clean, flat surface.
16. At the front of the first boom section, remove rubber bumper to the Extend/Retract cylinder retainer. Inspect the rubber bumper. If it is in good condition, the rubber bumper can be reused. If the bumper is showing signs of cracking or deterioration, it should be replaced.
17. Remove the two yoke plates to the mount at the front of the boom. Inspect the yoke plates for wear or distortion. If any wear or distortion is detected, both plates must be replaced. If no wear is detected, the plates can remain assembled to the extend chain clevis.
18. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."

3.4.5 First Boom Section Installation

1. On the rear of the boom, assemble the Extend and Retract bulkhead fittings to the mounting plate on the right side. Insert the fittings from the bottom up and secure in place with the bulkhead fitting nuts on the top side. Tighten securely. Repeat this procedure for the Attachment Tilt fittings on the left side.

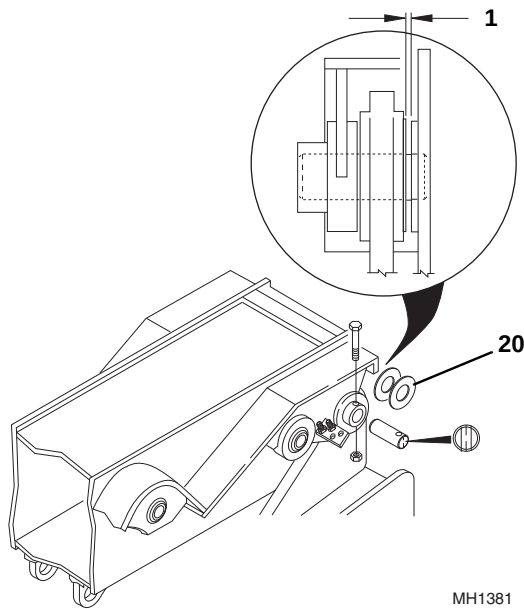
Note: Keep the caps on the threaded ends of the fittings to protect the threads from damage and to keep dirt and debris from entering the hydraulic system.

2. If equipped with Auxiliary hydraulics, assemble the Auxiliary hydraulic bulkhead fittings to the mounting plate on the left side. Insert the fittings from the bottom up into the outer set of holes and secure in place with the bulkhead fitting nuts on the top side. Tighten securely.
3. Using a sling, position the Extend/Retract cylinder to its original orientation under the boom.
4. Coat the base end of the cylinder with anti-seize compound. Insert the base end cylinder pin through both mounting ears and the base end of the Extend/Retract cylinder. Secure the pin in place with a retaining ring on each side of the pin.
5. Lift the rod end of the Extend/Retract cylinder enough to insert the threaded stud on the rubber bumper into the hole in the Extend/Retract cylinder retainer. Secure the rubber bumper in place with a locknut. Tighten securely. Lower the rod end of the Extend/Retract cylinder, and allow it to rest on the rubber bumper.



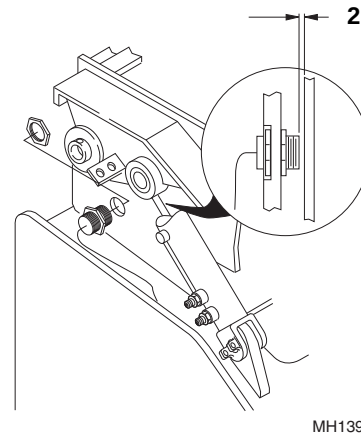
Boom

6. Using a suitable hoist and slings, lift the boom assembly and position the boom on the frame. Align the mounting plates on the frame between the mounting hubs on each side of the boom assembly. Lower the boom assembly until the holes in the boom assembly and the mounting plates align.
7. On the end of the boom pivot pin, closest to the capscrew hole, mark the capscrew mounting hole location. Coat the entire pin with anti-seize compound.
8. Insert the pivot pin from the outside of the boom assembly, making sure the marks for the capscrew mounting hole stay in line with the capscrew mounting holes in the boom mounting hub.

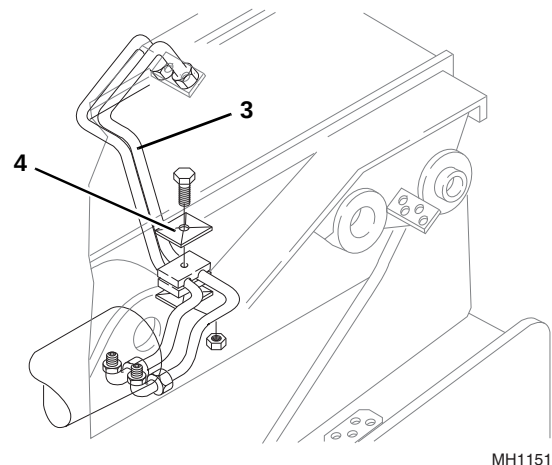


9. Shim the boom as required using the shims (20) to maintain a 0.10" (2,5 mm) maximum gap (1) between the boom mounting hub and the self-aligning bearing in the frame. If an additional shim is required to maintain the maximum gap, the extra shim MUST be inserted on the right side of the boom.
10. Align the rod end of the right Lift/Lower cylinder with the self-aligning bearing on the boom assembly. Coat the entire Lift/Lower cylinder pin with anti-seize compound. Insert the pin through the rod end of the cylinder and the self-aligning bearing. Secure with lock bolt. Repeat procedure with left Lift/Lower cylinder.

11. Use a hoist or suitable support to position the right side Slave cylinder to its original orientation onto the lower cylinder mount. Coat the entire Slave cylinder pin with anti-seize compound. Insert the pin through the rod end of the cylinder and the self-aligning bearing. Secure with lockbolt. Repeat procedure for left side Slave cylinder.
12. Install the boom proximity sensor on the right side mounting plate. With the boom properly shimmed, position the boom assembly all the way to the right side.



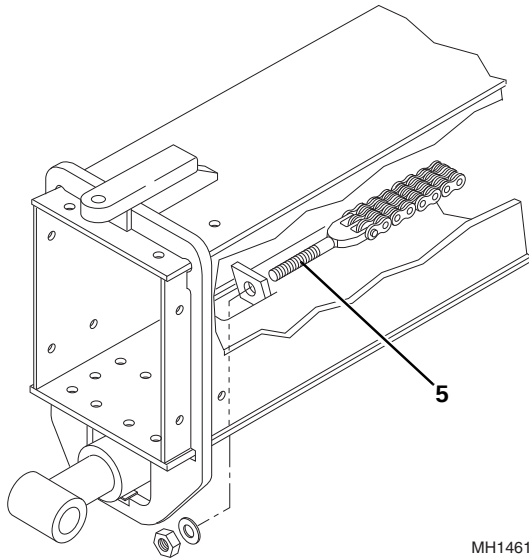
13. Insert the boom proximity sensor through the hole in the right side mounting plate. Install the jam nut onto the boom proximity sensor on the inside of the plate. Adjust the inner and outer jam nuts on the sensor until the gap (2) between the sensor and the boom is 0.12 in (3 mm). Torque the inside jam nut to 36 lb-in (4,1 Nm), to hold the sensor in position.



14. Install the Extend and Retract tubes (3) to the inside bulkhead fitting and the Extend/Retract cylinder.
15. Install the Extend and Retract tube clamp halves (4).
16. Uncap and connect the hydraulic hoses and attach to their appropriate cylinder locations.

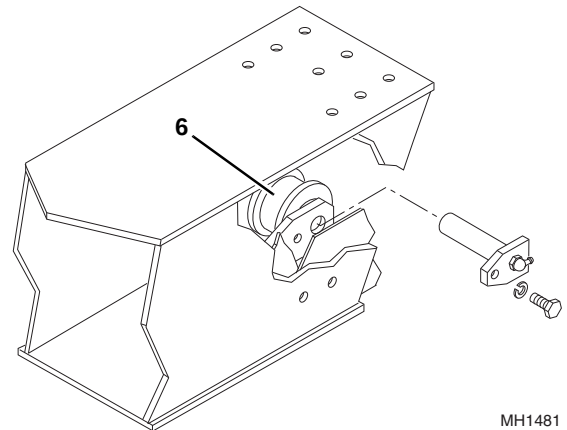


17. Install the Extend and Retract and Auxiliary (if equipped) tube assemblies to their appropriate bulkhead fittings. Secure with tube clamps.
18. Uncap and connect the previously labeled Attachment Tilt and Auxiliary (if equipped) hydraulic hoses to their appropriate bulkhead fittings.

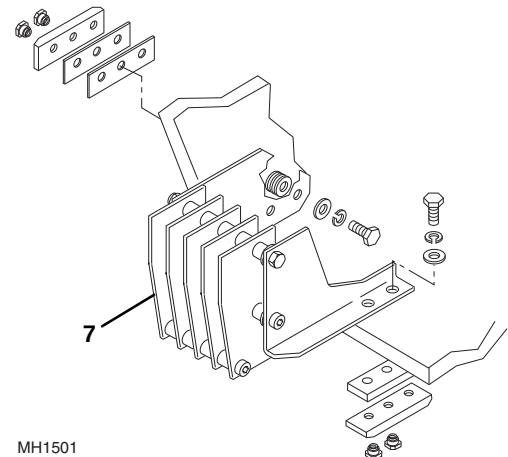


19. Inside the rear of the boom, slide the threaded clevis end (5) of the retract chain down the right side of the boom. Guide the threaded part of the clevis out through the hole in the tab on the bottom of the boom. Pull threaded part of clevis all the way through tab.
20. Coat the entire threaded portion of the clevis with multi-purpose grease. Install a flat washer and locknut onto the clevis. Thread the nut onto the clevis until the threads are flush with the top of the nut.
21. Install the bottom wear pads to the first boom section with the previously used hardware.

3.4.6 Second Boom Section Installation



1. At the rear of the second boom section, assemble the retract chain sheave (6) to the mounting ears on the right side of the boom. Place the sheave between the ears and insert the sheave pin from the left side. Align the hole in the pin retainer plate with the threaded hole in the left ear. Secure the pin.
2. Apply grease to the grease fitting in the pin. Spin the sheave by hand to ensure the sheave spins freely on the pin and to distribute grease evenly.

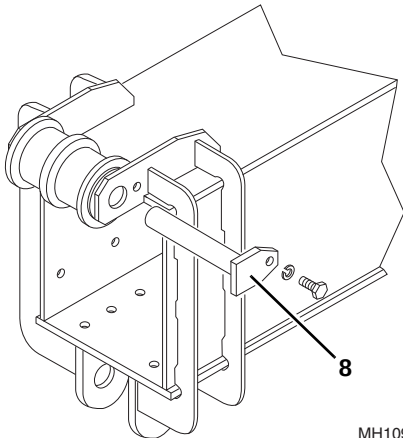


3. Install the hose reel assembly (7), left side and bottom wear pads to the rear of the second boom section.
4. Install the boom side and top wear pads.
5. Grease the sections of the boom in areas where the wear pads will slide.



Boom

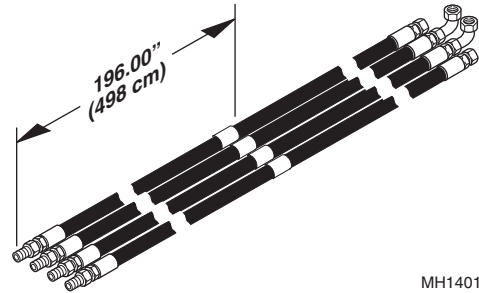
6. Before installing the second boom section into the first boom section, place a string (heavy enough to pull the Attachment Tilt and Auxiliary hydraulic hoses) down the inside of the boom. Allow the string to hang out the rear of the boom. Pull the other end out the opening on the left side of the boom where the hoses will exit the boom. Position the strings all the way to the left side of the first boom section.
7. Using a suitable sling, carefully slide the second boom section into the first boom section. Leave enough room at the front of the boom to install the center wear pad.
8. Install the center wear pad mount and wear pad to the bottom front of the first boom section.
9. Install the side and top wear pads to the front of the first boom section.



MH1091

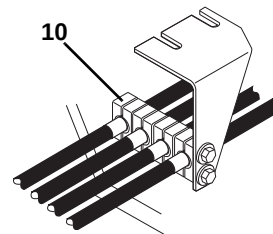
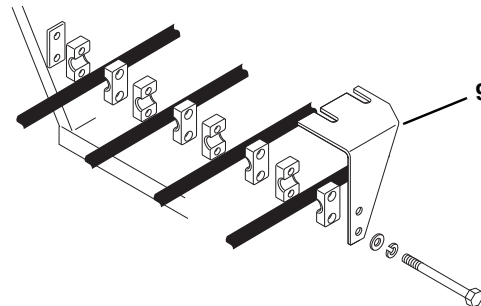
10. Install the double extend chain sheave (8) to the front of the second boom section.
11. With the sling still in place, install the rod end of the Extend/Retract cylinder, pin and retaining ring.
12. Install the front, bottom wear pads in the second boom section.

3.4.7 Third Boom Section Installation



MH1401

1. Stretch the Attachment Tilt and Auxiliary (if equipped) hoses out straight on a flat surface. Measure from the male end of each hose back 196 in (498 cm) and apply tape around each hose at that point. The tape is for proper tensioning of the hoses during reassembly of the hose clamps.
2. Slide the elbow ends of the hoses down the third boom section and out the boom head. Be careful not to cross the hoses as you pull them out. Secure the hoses in place with hose clamps. DO NOT tighten the hose clamps at this time.

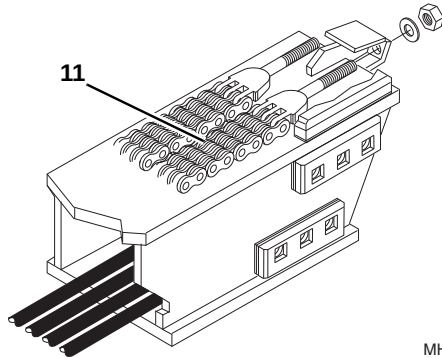


MH1631

3. Install the hose clamp support bracket (9) and top left side wear pad to the third boom section (Auxiliary hydraulics only).
4. Position the Attachment Tilt and Auxiliary hydraulic hoses with the edge of the tape at the hose clamps (10). Hold the hoses in this position, and tighten the hose clamps.

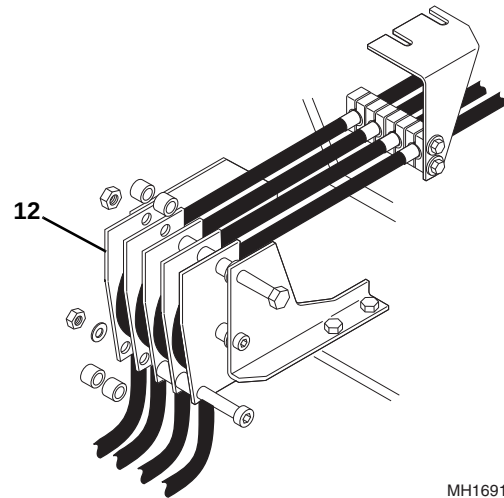


5. Install the top, bottom and side wear pads to the rear of the third boom section. If the machine is equipped with Auxiliary hydraulics, the top left wear pad is already installed.



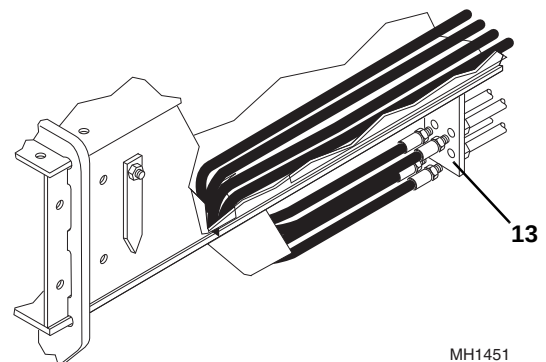
MH1651

6. Lay the two extend chains (11) on the top of the third boom section with the threaded clevis ends toward the rear of the boom. Coat the threads on each clevis with multi-purpose grease and insert the clevis' through the holes in the anchor plate. Install a washer and locknut onto each clevis. Tighten the locknut enough so the threads are even with the top of the locknut.
7. At the rear of the third boom section, place the male ends of the hydraulic hoses in the third boom section to prevent damage while installing the third boom section into the second boom section.
8. Grease the sections of the boom in areas where the wear pads will slide.
9. Using a suitable sling, carefully slide the third boom section into the second boom section. Leave enough room at the front of the boom to install the remaining wear pads.
10. Install the top and side wear pads to the inside of the second boom section.
11. Pull the male ends of the hydraulic hoses out the rear of the third boom section. Stretch the hoses out straight behind the machine.



MH1691

12. Assemble the hoses to the hose reel (12) at the rear of the boom.
- Note:** Keep the hoses in the same order as they come from the hose clamps. DO NOT allow the hoses to cross.
13. Tie the strings (positioned inside the first boom section) to the male end of the hydraulic hoses coming off the bottom of the hose reel assembly.
 14. Working from the front of the boom, pull each hose through the boom assembly through the opening at the bottom of the first boom section.
 15. Remove the strings from the hoses.



MH1451

16. At the front of the first boom section, assemble the hose assemblies and tube assemblies to the mounting plate (13).

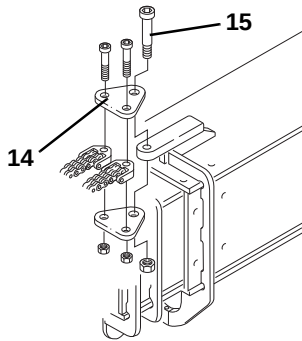
Note: Where the hose assemblies come out of the outer boom, lubricate the radius in the first boom section with soap and water to allow proper tensioning of hoses.

17. Place the retract chain up around the retract chain sheave on the right side of the boom. Stretch the chain forward and place the clevis between the two anchor plates. Align the hole in the clevis with the second hole from the rear of the anchor plates.



Boom

18. Insert the shoulder bolt from the top down and secure in place with a locknut.



19. Assemble the two extend chains to the mount if the yoke plates (14) were removed from the extend chains. Secure in place with a locknut. Tighten the locknut securely; but the yoke plates must pivot freely.
20. Align the holes in the yoke plates with the hole in the mount on the first boom section. Coat the shoulder bolt (15) with anti-seize compound and insert the shoulder bolt through the yoke plates and the mount on the boom. Secure in place with a locknut. Tighten the locknut securely; but the yoke plates must pivot freely.
21. Install the quick attach and Attachment Tilt cylinder to the front of the boom. Refer to Section 3.8.4, "Quick Attach Installation."
22. If necessary, install the Auxiliary hydraulic fittings to the front of the boom.
23. Uncap and connect the previously labeled hoses to the Attachment Tilt cylinder.
24. Properly connect the battery.
25. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
26. Start the engine and operate all boom functions several times. Check the chain tension again and adjust as necessary. Check for leaks, and check the hydraulic fluid level in the tank; add fluid if required.
27. Clean up all debris, hydraulic fluid, etc., in, on, near and around the machine.
28. Install the rear cover to the boom.
29. Close and secure the rear door.

3.4.8 Boom Installation

1. Park the machine on a hard, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Using suitable slings, balance the boom assembly, lift and guide the boom assembly into place. Align the frame pivot bores with the boom assembly pivot bores. Install the boom pivot pin.
3. Move the Attachment Tilt joystick in both directions to relieve any trapped pressure in the Attachment Tilt system. If the machine is equipped with Auxiliary controls, move the Auxiliary hydraulic joystick in both directions to relieve any trapped pressure in the Auxiliary hydraulic system.
4. With the sling still in place, install the rod end of the slave cylinder, pin and bolt. Apply Loctite® 242™ torque lock bolt to 100-110 lb-ft (135-149 Nm).
5. With the sling still in place, install the rod end of each lift/lower cylinder, pin and bolt. Apply Loctite® 242™ torque lock bolt to 200-215 lb-ft (271-291 Nm).
6. Uncap and connect the hydraulic hoses at the rear of the boom.
7. Connect the boom proximity sensor at the rear of the boom.
8. Recheck wear pad gaps to ensure they meet the minimum gap requirement. Shim as necessary.
9. Ensure that the boom chains are properly adjusted. Refer to Section 3.7.6, "Boom Chain Tension Adjustment (6036, 6042, 8042 & 10042)."
10. Properly connect the battery.
11. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
12. Start the engine and operate all boom functions several times. Check for leaks, and check the hydraulic fluid at the reservoir; add fluid if required.



3.5 BOOM SYSTEM - FOUR SECTION (10054)

3.5.1 Boom System Operation

The four section boom consists of the fourth, third, second and first boom assemblies with double intermediate boom extend chains, a single inner boom extend chain, a single inner boom retract chain and a single intermediate boom retract chain.

As the Extend/Retract hydraulic cylinder, which is anchored at the front of the second boom section, and the rear of the first boom section begins to extend, it forces the second boom section out of the first boom section.

The fourth, third, second and first boom sections are connected by extend and retract chains. These chains are routed around sheaves on the third and second boom sections. As the second and third boom sections are forced out, the extend chain pulls the fourth boom section out of the third.

As hydraulic pressure is applied to the retract port on the Extend/Retract cylinder, the third boom section is pulled back into the fourth boom section, and the retract chain pulls the third and fourth boom sections back into the second boom section.

This mechanical linkage formed by the chains and supporting hardware, extends and retracts the second, third and fourth boom sections at the same rate.

The first boom section does not extend or retract, but lifts and lowers via action of the Lift/Lower cylinders.

3.6 BOOM ASSEMBLY MAINTENANCE

These instructions must be completed in sequence. The fourth boom section must be removed before removing the third boom section. The third boom section must be removed before removing the second boom section. The fourth, third and second boom section must be removed at one time before removing the first boom section.

Before beginning, conduct a visual inspection of the machine and work area, and review the task about to be undertaken. Read, understand and follow these instructions.



WARNING

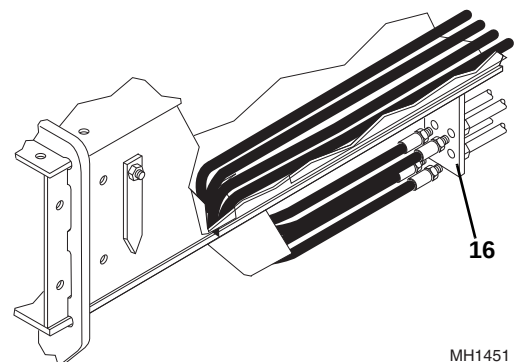
NEVER weld or drill the boom unless approved in writing by the manufacturer. The structural integrity of the boom will be impaired if subjected to any repair involving welding or drilling.

3.6.1 Fourth Boom Section Removal

1. Remove any attachment from the quick attach assembly. Refer to Section 3.8.1, "Disconnecting from an Attachment."

Note: If replacing the fourth section boom, remove the quick attach from the fourth section. Refer to Section 3.8.3, "Quick Attach Removal."

2. Park the machine on a hard, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
3. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
4. Open the rear door. Allow the system fluids to cool.
5. Move the Attachment Tilt joystick in both directions to relieve any trapped pressure in the Attachment Tilt system. If the machine is equipped with Auxiliary controls, move the Auxiliary hydraulic joystick in both directions to relieve any trapped pressure in the Auxiliary hydraulic system.
6. Label, disconnect and cap the hoses attached to the Attachment Tilt cylinder. Cap all fittings to keep dirt and debris from entering the hydraulic system.
7. If the machine is equipped with Auxiliary hydraulics, label, cap and remove the hoses from the bulkhead fittings. If replacing the fourth boom section with a new boom section: Remove the female coupler, male nipple and bulkhead fittings from the bulkhead plate inside the boom head.
8. Remove the rear cover from the boom.

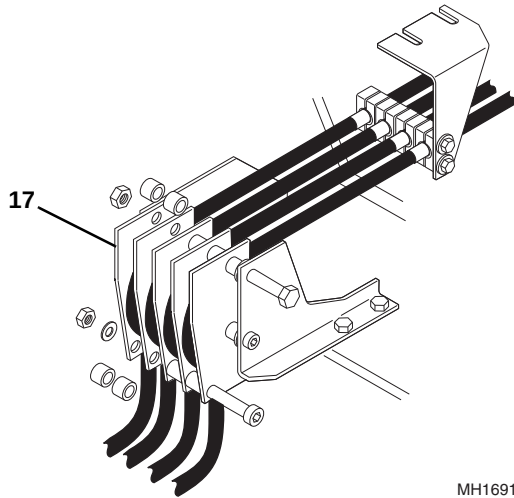


MH1451

9. At the front of the first boom section, label and remove the hydraulic hoses from the bottom tube assemblies at the mounting plate (16). Cap the hose ends.

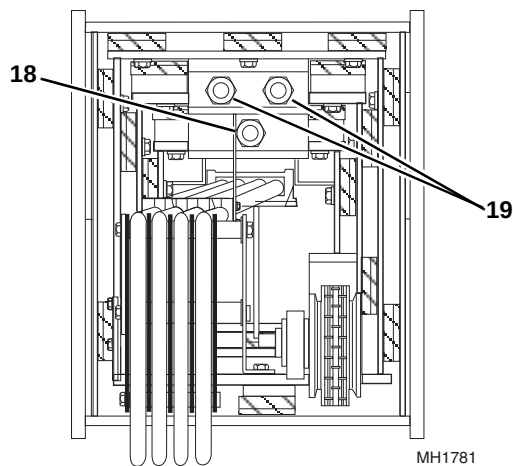


Boom



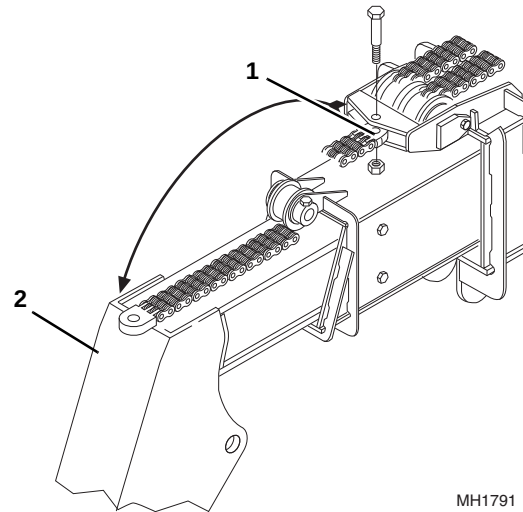
MH1691

10. Label and remove the hydraulic hoses from the hose reel (17).



MH1781

11. At the rear of the boom, locate the fourth boom section extend chain locknut (18). Measure the amount of threads protruding beyond the locknut and record the measurement for reassembly.
12. Loosen, but DO NOT remove the locknut.
13. At the rear of the boom, locate the two third boom section extend chain locknuts (19). Measure the amount of threads protruding beyond each locknut and record the measurements for reassembly.
14. Loosen, but DO NOT remove the locknuts.
15. Return to the cab, start the engine and extend the boom approximately 2 in (51 mm). Retract the boom slightly until there is slack in the fourth boom section extend chain. Shut the engine OFF.

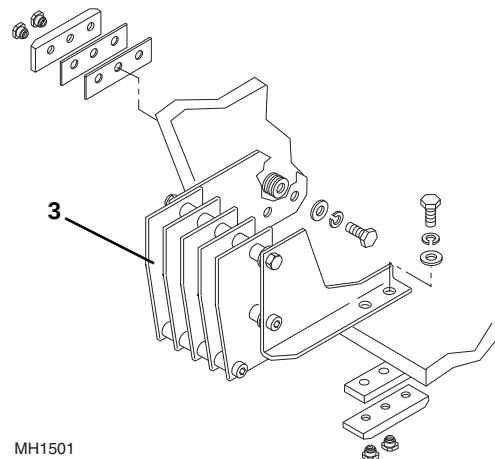


MH1791

16. At the front of the boom, disconnect the fourth boom section extend chain clevis (1) from the anchor plates on the third boom section. Pull the extend chain clevis from between the plates and lay over the front of the fourth boom section (2).

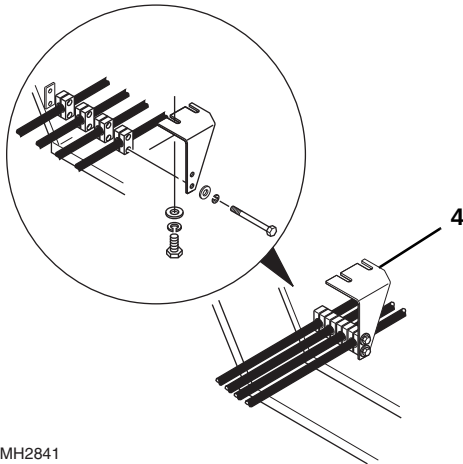
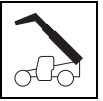
17. Remove the extend chain sheave.

18. Remove the top and side wear pads on the inside of the third boom section. Label and tag each set of wear pads being removed.



MH1501

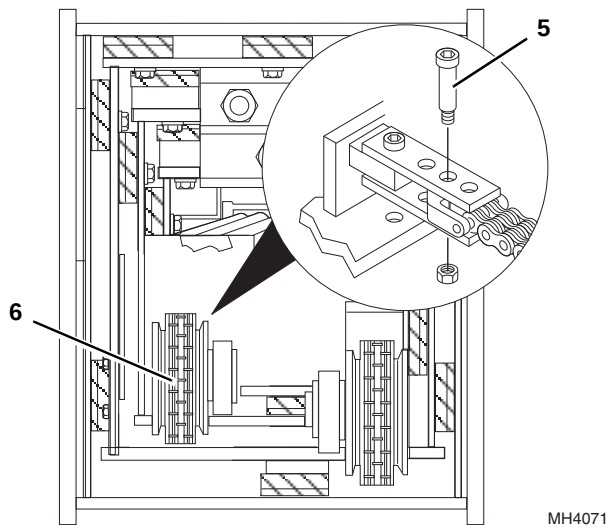
19. At the rear of the boom, remove the hose reel assembly (3). This requires removal of the bottom and side wear pads. Reinstall the wear pads for second boom section removal.



MH2841

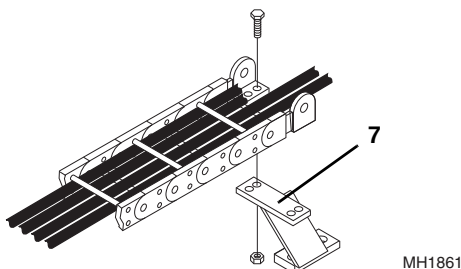
20. Inside the third boom section, remove the hose clamps and hose clamp support bracket (4).
21. Return to the cab, start the engine and fully retract the boom slowly. Shut the engine OFF.

Note: Record the location of the shoulder bolt to ensure correct installation.



MH4071

22. At the rear of the boom, remove the shoulder bolt (5) to the fourth boom section retract chain (6). Let the chain hang out the rear of the boom.

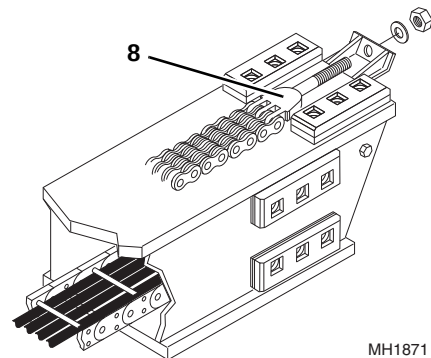


MH1861

23. Remove the two capscrews and lockwashers holding the hose carrier support (7) and the lower wear pad to the third boom section.
24. Pull the hose carrier support with hose carrier attached toward the rear of the boom. Reinstall the capscrews and lockwashers to hold the wear pad in place. DO NOT fully tighten the capscrews.
25. Remove the hose carrier support from the hose carrier.

Note: If replacing the third boom section with a new boom section, the quick attach assembly and the Attachment Tilt cylinder should be removed at this time. Refer to Section 3.8.3, "Quick Attach Removal."

26. Using a sling or suitable support, pull the fourth boom section straight out of the third boom section. Reposition the slings as needed so the fourth boom section balances when removed from the third boom section. Set the boom section down on a hard, level surface. Support the boom as needed to prevent it from tipping over.

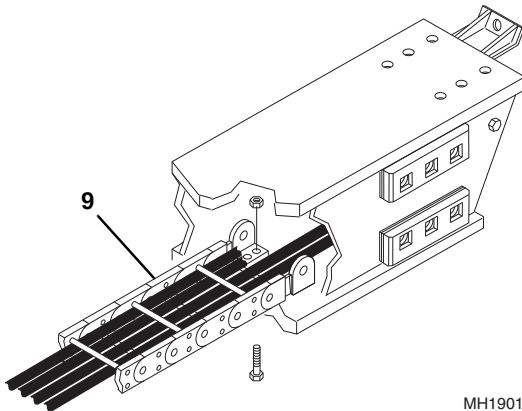


MH1871

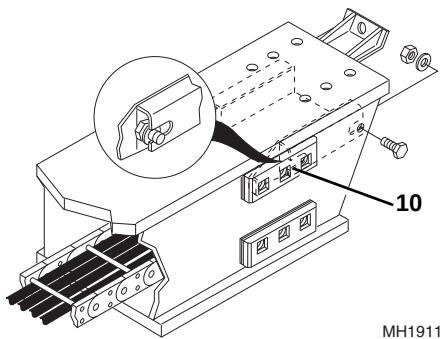
27. At the rear of the boom section, remove the extend chain clevis (8) from the extend chain clevis anchor.
28. At the rear of the fourth boom section, remove the remaining wear pads, shims and hardware. Label and tag each set of wear pads being removed.
29. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."



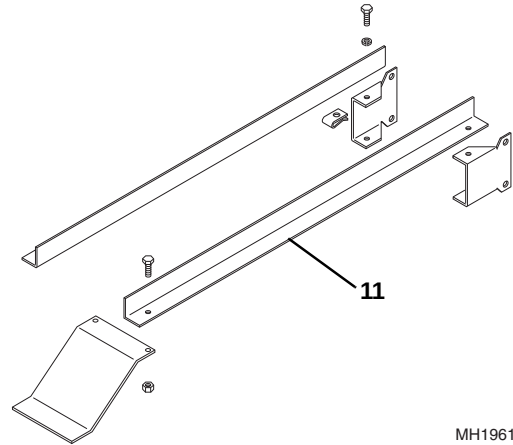
Boom



30. Inside the boom section, remove the hardware securing the hose carrier (9) to the bottom of the boom.
31. On each side of the boom, remove the hardware securing the rear of the hose carrier guide in place.



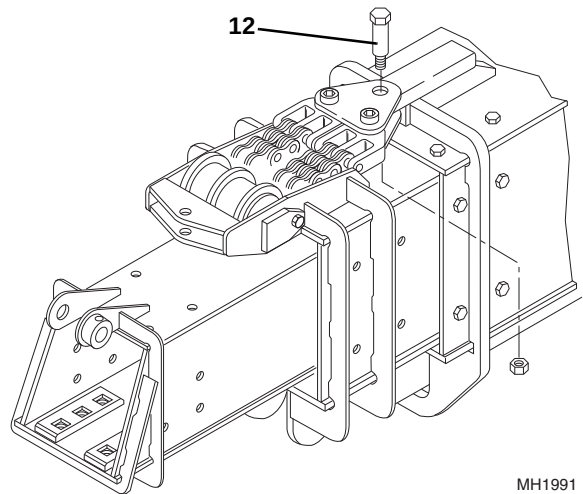
32. Loosen, but DO NOT remove the hardware holding the front of the hose carrier guide and the top wear pad (10) to each side of the boom.
33. Tilt the back of the hose carrier guide up. Label all hoses and their orientations. Pull the hoses from the channels inside the boom. Lay the hoses out behind the boom.
34. After the hoses are removed, remove the hose carrier guide by pulling the guide out the rear of the boom.



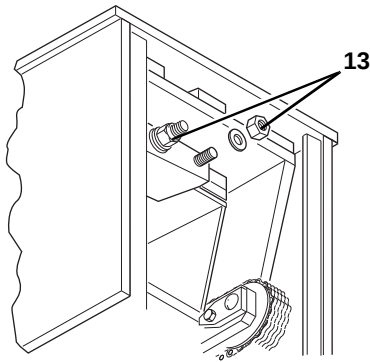
35. Remove the hose carrier assembly (11) from the boom by carefully pulling both the upper and lowers portions through the rear of the boom at the same time.
36. Carefully slide the hose channel assembly out of the rear of the boom.

3.6.2 Third Boom Section Removal

1. At the front of the second boom section, remove the top and side wear pads. Label and tag each set of wear pads being removed.



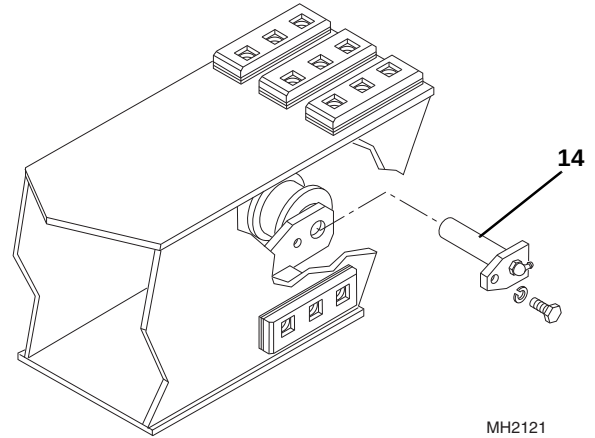
2. Remove the shoulder bolt (12) holding the yoke plates to the mount at the front of the first boom section.
3. Remove the extend chain sheave pin and sheave on the third boom section.



4. Remove the locknuts (13) holding the threaded clevis of the extend chains to the anchor bracket on the rear of the third boom section.
5. Pull both extend chains out from the front of the boom.
6. At the rear of the third boom section, remove the retract chain sheave.
7. Remove the shoulder bolt. Let the retract chain hang out the rear of the boom.
8. Using a sling or suitable support, pull the third boom section straight out of the second boom section. Reposition the slings as needed so the third boom section balances when removed from the second boom section. Set the boom section down on a hard, level surface. Support the boom as needed to prevent it from tipping over.
9. Remove the remaining wear pads, shims and hardware. Label and tag each set of wear pads being removed.
10. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."

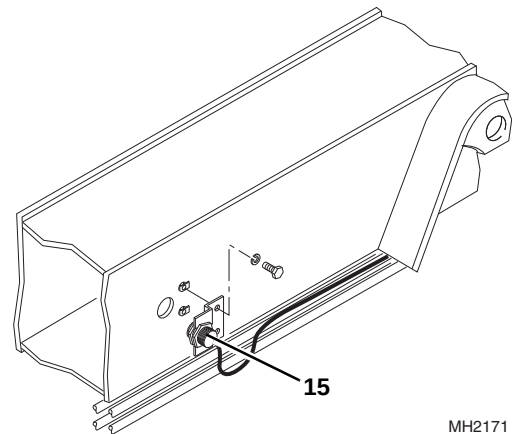
3.6.3 Second Boom Section Removal

1. At the front of the first boom section, remove the top, side and bottom wear pads. Label and tag each set of wear pads being removed.



MH2121

2. Remove the retract chain sheave (14) from the inside of the second boom section.
3. Using a suitable sling or support, secure the front of the Extend/Retract cylinder.
4. Remove the retaining ring from one side of the Extend/Retract cylinder rod end mounting pin.



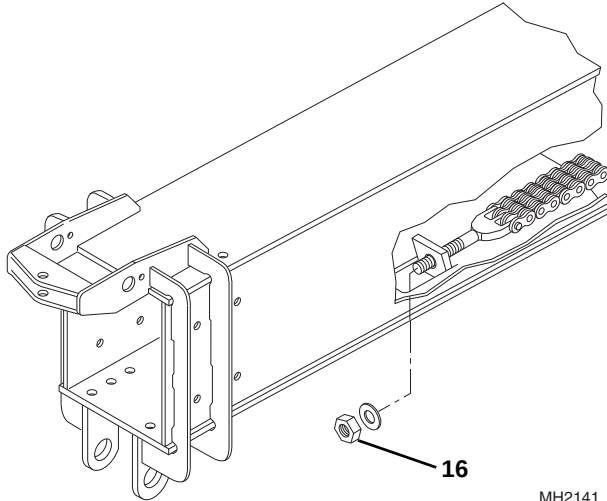
MH2171

5. On the left side of the first boom section, remove the boom extend interlock proximity sensor (15) and mounting bracket.
6. Using a sling or suitable support, pull the second boom section straight out of the first boom section. Reposition the slings as needed so the second boom section balances when removed from the first boom section. While pulling the second boom section out of the first boom section, guide the retract chain into the rear of the boom. Set the boom section down on a hard, level surface. Support the boom as needed to prevent it from tipping over.



Boom

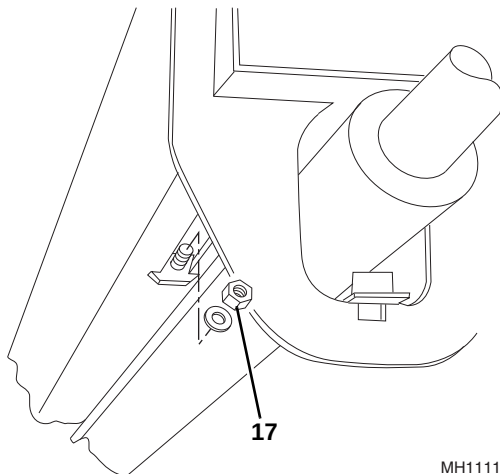
7. Remove the remaining wear pads, shims and hardware. Label and tag each set of wear pads being removed.
8. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."



9. At the underside of the second boom section, remove the locknut (16) from the retract chain clevis. Pull the retract chain out of the boom through the rear of the boom.

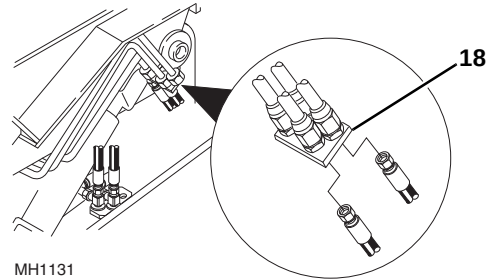
3.6.4 First Boom Section Removal

1. Attach a suitable overhead lifting device and sling to the Lift/Lower cylinder, and remove slack in the sling.
2. Securely support the first boom section.
3. Remove all wear pads, shims and hardware. Label and tag each set of wear pads being removed.

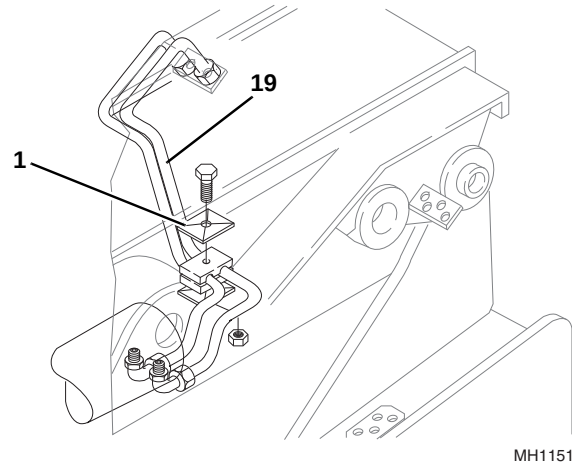


4. At the underside of the boom, remove the retract chain locknut (17). Measure the amount of threads protruding beyond the locknut and record the measurement for reassembly of the chain.

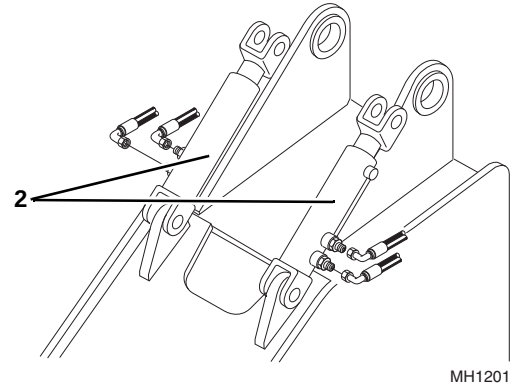
5. Remove the retract chain by pulling it out the rear of the boom.



6. Label, disconnect and cap the Attachment Tilt and Auxiliary (if equipped) hydraulic hoses on the mounting plate (18).
7. Label, disconnect and cap the Attachment Tilt and Auxiliary (if equipped) hydraulic tubes from the bulkhead fittings.
8. Label, disconnect and cap the Extend/Retract hydraulic hoses from the bulkhead fittings.



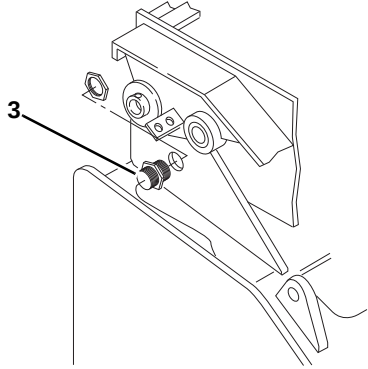
9. Label, disconnect and cap the Extend/Retract hydraulic tubes (19) from the bulkhead fittings. Remove the tube clamps (1).



10. Label, disconnect and cap the hydraulic hoses attached to the Slave cylinders (2).

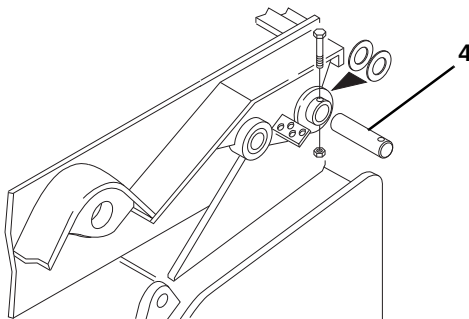


11. Use a hoist and a sling to hold the left Slave cylinder in position. Remove the lockbolt from the Slave cylinder rod end mounting pin. Remove the locknut from the base end of Slave cylinder. Lift the Slave cylinder away from the machine. Repeat procedure for the right Slave cylinder.



MH1221

12. On the right side boom pivot mounting plate, remove the boom proximity sensor (3).
13. With the boom securely supported, block the Lift/Lower cylinders. Remove the lockbolts from the rod end of the cylinders and lower the cylinders onto the machine.



MH1241

14. Remove the boom pivot pins (4) and lockbolts.
15. Using a sling or suitable support, carefully lift the first boom section away from the machine. Set the boom section down on a hard, level surface. Support the boom as required to allow removal of the Extend/Retract cylinder from the underside of the boom.
16. Inspect all wear pads for wear. Refer to Section 3.9, "Boom Wear Pads."
17. Use a hoist and slings to support the Extend/Retract cylinder.
18. Remove the retaining rings from the ends of the Extend/Retract cylinder.

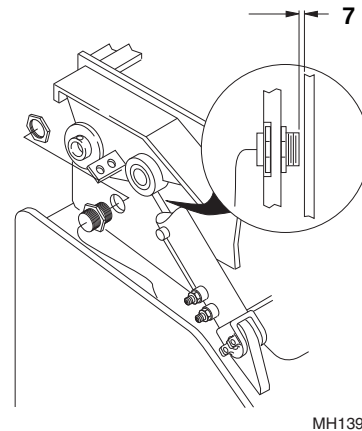
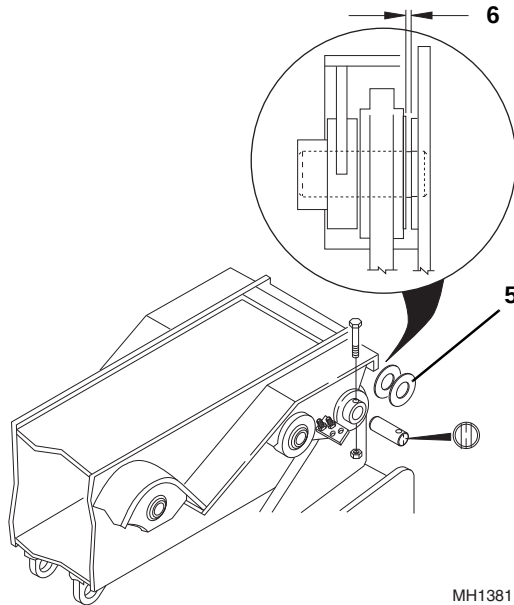
19. Remove the rubber bumper from the Extend/Retract cylinder retainer. Inspect the rubber bumper. If it is in good condition, the rubber bumper can be reused. If the bumper is showing signs of cracking or deterioration, it should be replaced.
20. Remove the Extend/Retract cylinder from the boom.

3.6.5 First Boom Section Installation

1. Using a suitable hoist and sling, position the Extend/Retract cylinder with the port elbows facing down. Place the rod end of the cylinder through the cylinder retainer at the front of the boom.
2. Coat the base end of the cylinder with anti-seize compound. Insert the base end cylinder pin through both mounting ears and the base end of the Extend/Retract cylinder. Secure the pin in place with a retaining ring on each side of the pin.
3. Lift the rod end of the Extend/Retract cylinder enough to insert the threaded stud on the rubber bumper into the hole in the Extend/Retract cylinder retainer. Secure the rubber bumper in place with a new locknut. Tighten securely. Lower the rod end of the Extend/Retract cylinder, and allow it to rest on the rubber bumper.
4. Using a suitable hoist and slings, lift the boom assembly and position the boom on the frame. Align the mounting plates on the frame between the mounting hubs on each side of the boom assembly. Lower the boom assembly until the holes in the boom assembly and the mounting plates align.
5. On the end of the boom pivot pin, closest to the capscrew hole, mark the capscrew mounting hole location. Coat the entire pin with anti-seize compound.
6. Insert the pivot pin from the outside of the boom assembly, making sure the marks for the capscrew mounting hole stay in line with the capscrew mounting holes in the boom mounting hub.

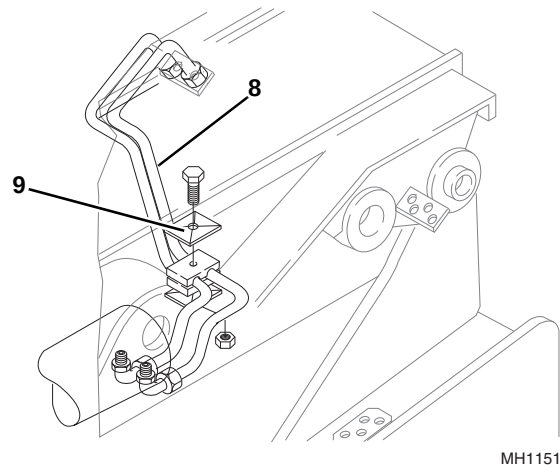


Boom

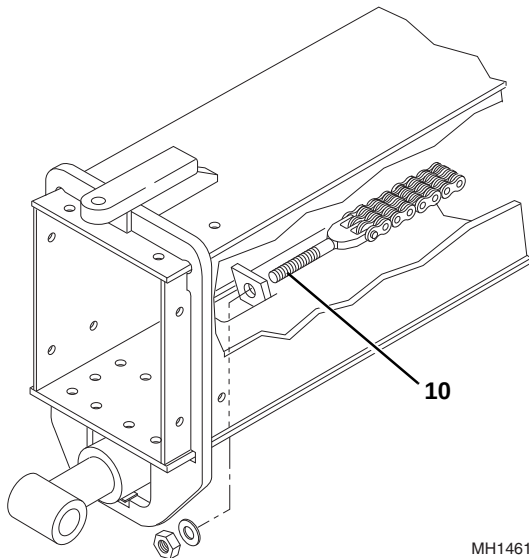


7. Shim the boom as required using the shims (5) to maintain a 0.10 in (2,5 mm) maximum gap (6) between the boom mounting hub and the self-aligning bearing in the frame. If an additional shim is required to maintain the maximum gap, the extra shim **MUST** be inserted on the right side of the boom.
8. Align the rod end of the right Lift/Lower cylinder with the self-aligning bearing on the boom assembly. Coat the entire Lift/Lower cylinder pin with anti-seize compound. Insert the pin through the rod end of the cylinder and the self-aligning bearing. Secure with lock bolt. Repeat procedure with left Lift/Lower cylinder.
9. Use a hoist or suitable support to position the right side Slave cylinder to its original orientation onto the lower cylinder mount. Coat the entire Slave cylinder pin with anti-seize compound. Insert the pin through the rod end of the cylinder and the self-aligning bearing. Secure with lockbolt. Repeat procedure for left side Slave cylinder.
10. Install the boom proximity sensor on the right side mounting plate. With the boom properly shimmed, position the boom assembly all the way to the right side.

11. Insert the boom proximity sensor through the hole in the right side mounting plate. Install the jam nut onto the boom proximity sensor on the inside of the plate. Adjust the inner and outer jam nuts on the sensor until the gap (7) between the sensor and the boom is 0.12 in (3 mm). Torque the inside jam nut to 36 lb-in (4,1 Nm), to hold the sensor in position.



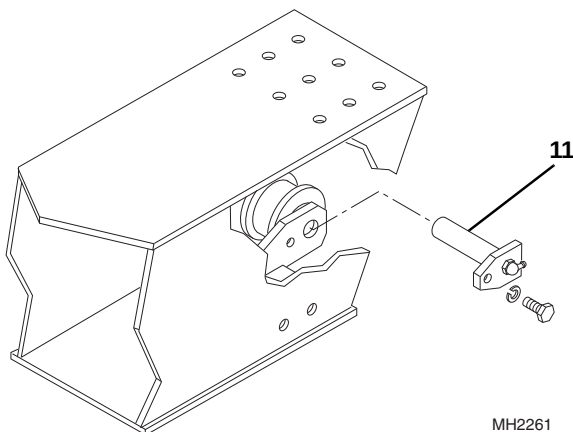
12. Install the Extend and Retract tubes (8) to the inside bulkhead fitting and the Extend/Retract cylinder.
13. Install the Extend and Retract tube clamp halves (9).
14. Uncap and connect the previously labeled hydraulic hoses and attach to their appropriate cylinder locations.
15. Install the Extend and Retract and Auxiliary (if equipped) tube assemblies to their appropriate bulkhead fittings. Secure with tube clamps.
16. Uncap and connect the previously labeled Attachment Tilt and Auxiliary (if equipped) hydraulic hoses to their appropriate bulkhead fittings.



MH1461

17. Inside the rear of the boom, slide the threaded clevis end (10) of the retract chain down the right side of the boom. Guide the threaded part of the clevis out through the hole in the tab on the bottom of the boom. Pull threaded part of clevis all the way through tab.
18. Coat the entire threaded portion of the clevis with multi-purpose grease. Install a flat washer and locknut onto the clevis. Thread the nut onto the clevis until the threads are flush with the top of the nut.
19. Install the bottom wear pads to the first boom section with the previously used hardware.

3.6.6 Second Boom Section Installation

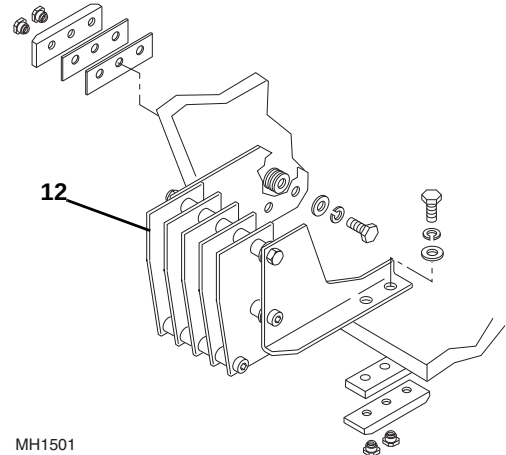


MH2261

1. At the rear of the second boom section, assemble the retract chain sheave to the mounting ears on the right side of the boom. Place the sheave between the ears and insert the sheave pin (11) from the left

side. Align the hole in the pin retainer plate with the threaded hole in the left ear. Secure the pin.

2. Apply grease to the grease fitting in the pin. Spin the sheave by hand to ensure the sheave spins freely on the pin and to distribute grease evenly.

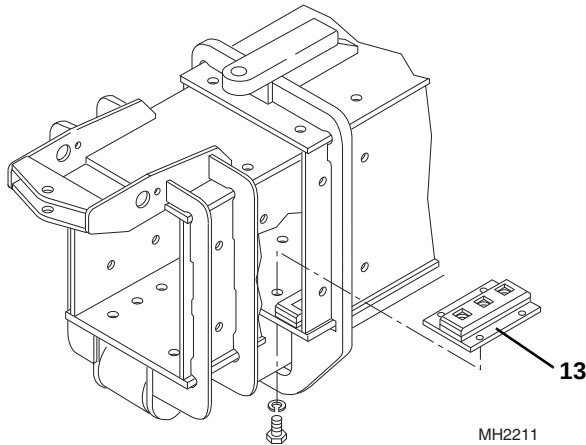


MH1501

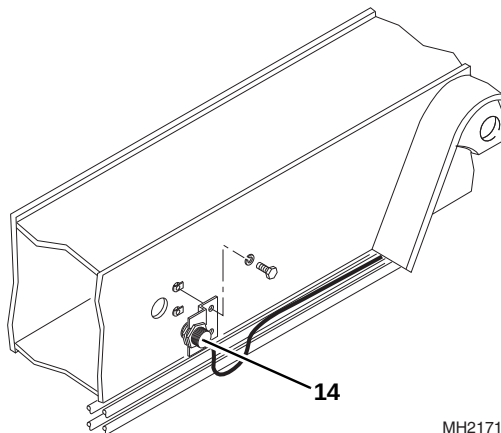
3. Install the hose reel assembly (12), left side and bottom wear pads to the rear of the second boom section.
4. Install the boom side and top wear pads of the second boom section.
5. Grease the sections of the boom in areas where the wear pads will slide.
6. Before installing the second boom section into the first boom section, place a string (heavy enough to pull the Attachment Tilt and Auxiliary hydraulic hoses) down the inside of the boom. Allow the string to hang out the rear of the boom. Pull the other end out the opening on the left side of the boom where the hoses will exit the boom. Position the strings all the way to the left side of the first boom section.
7. Using a suitable sling, carefully slide the second boom section into the first boom section. Leave enough room at the front of the boom to install the center wear pad.



Boom



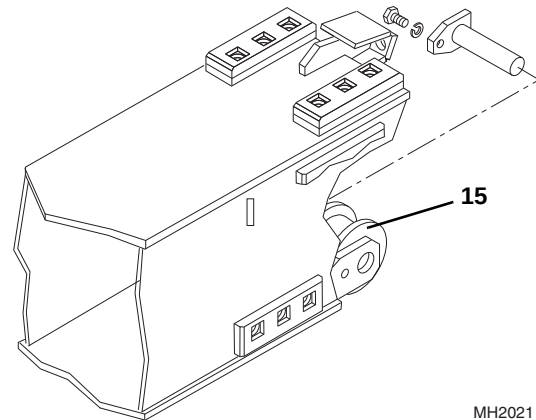
8. Install the center wear pad mount (**13**) and wear pad to the bottom front of the first boom section.
9. Install the side and top wear pads to the front of the first boom section.
10. Install the double extend chain sheave to the front of the second boom section.
11. With the sling still in place, install the rod end of the Extend/Retract cylinder, pin and retaining ring.
12. Install the front, bottom wear pads in the second boom section.



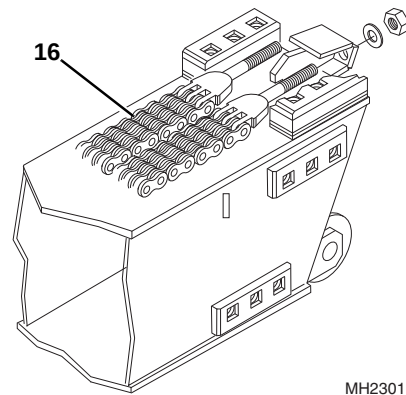
13. On the left side of the first boom section, reassemble the boom extend interlock sensor (**14**) with mounting bracket. Secure in place with the previously used hardware. Tighten securely.
14. Secure the boom extend interlock sensor wire to the Attachment Tilt tubes under the boom with new tie wraps.

3.6.7 Third Boom Installation

1. Install the bottom, side and top wear pads to the rear of the third boom section.



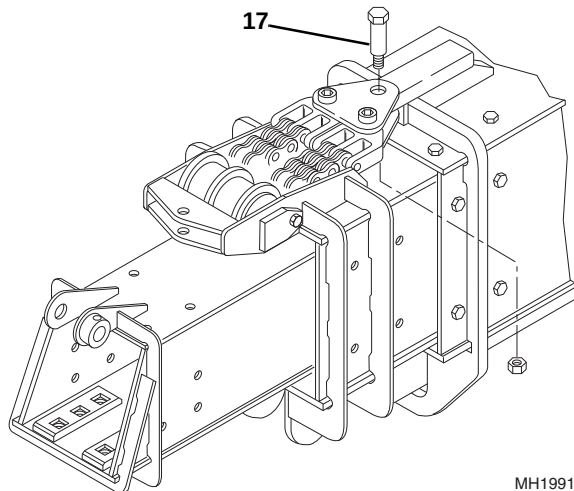
2. At the rear of the third boom section, assemble the retract chain sheave (**15**) to the mounting ears on the left side of the boom. Place the sheave between the ears and insert the sheave pin from the right side. Line up the hole in the pin retainer plate with the threaded hole in the right ear. Secure the pin.
3. Apply grease to the grease fitting in the pin. Spin the sheave by hand to ensure the sheave spins freely on the pin and to distribute grease evenly.
4. Install the bottom front wear pads.



5. Lay the two extend chains (**16**) on the top of the third boom section with the threaded clevis ends toward the rear of the boom. Coat the threads on each clevis with multi-purpose grease and insert the clevis' through the holes in the anchor plate. Install a washer and locknut onto each clevis. Tighten the locknut enough so the threads are even with the top of the locknut.
6. Grease the sections of the boom in areas where the wear pads will slide.

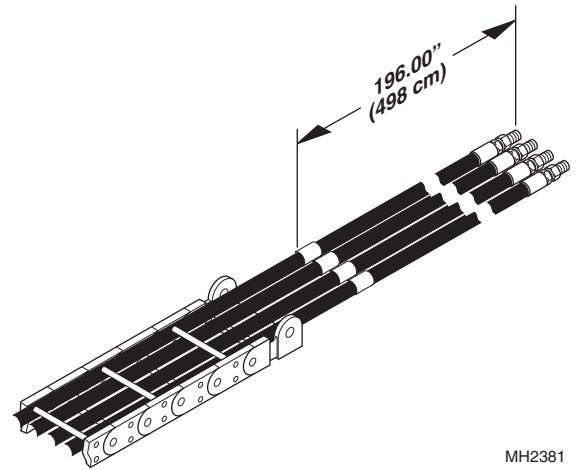


7. Using a suitable sling, carefully slide the third boom section into the second boom section. Leave enough room at the front of the boom to install the remaining wear pads.
8. Install the top and side wear pads to the inside of the second boom section.
9. Place the two extend chains up through the double sheave mounting bracket on the front of the second boom section.
10. Assemble the two extend chains to the mount if the yoke plates were removed from the extend chains. Secure in place with a locknut. Tighten the locknut securely; but the yoke plates must pivot freely.
11. Install the double extend chain sheave. Apply grease to the sheave. Turn the sheave by hand to distribute the grease evenly.

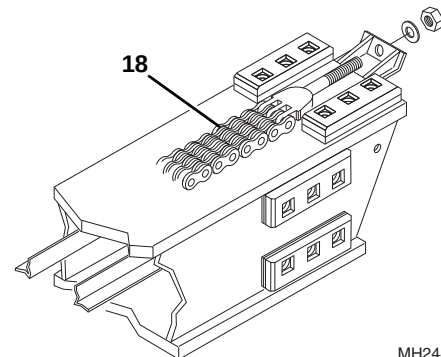


12. Align the holes in the yoke plates with the hole in the mount on the first boom section. Coat the shoulder bolt with anti-seize compound and insert the shoulder bolt (17) through the yoke plates and the mount on the boom. Secure in place with a locknut. Tighten the locknut securely; but the yoke plates must pivot freely.
13. Place the retract chain around the retract chain sheave on the right side of the boom. Stretch the chain forward and place the clevis between the two anchor plates. Align the hole in the clevis with the hole location recorded in the removal procedure. Insert the shoulder bolt and locknut, tighten securely.

3.6.8 Fourth Boom Section Installation



1. Lay the hose carrier assembly out flat on a level surface. Stretch the four male ends of the hoses out straight from the hose carrier assembly. Measure from the male end of each hose back toward the hose carrier assembly 196 in (498 cm) and apply tape around each hose at that point. The tape is for proper tensioning of the hoses during reassembly of the hose clamps.
2. Insert the hose channel assembly into the rear of the fourth boom section. Slide the hose channel assembly into the boom and line up the holes for the side wear pads.
3. Install the side, bottom and top wear pads.

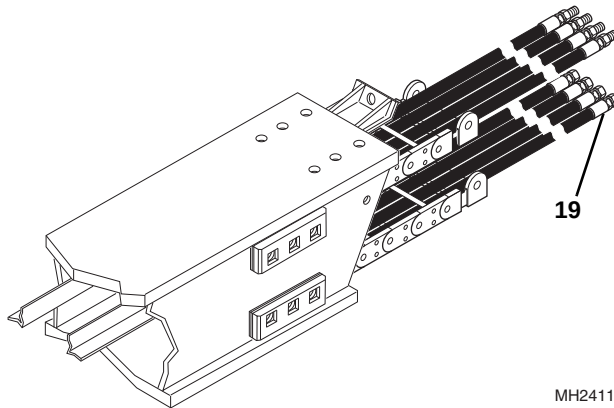


4. Lay the fourth boom section extend chain (18) on the top of the fourth boom section with the threaded clevis end toward the rear of the boom. Coat the threads on the clevis with multi-purpose grease and insert the clevis through the hole in the anchor plate. Install a washer and locknut onto the clevis. Tighten the locknut enough so the threads are even with the top of the locknut.

Note: The hose carrier only folds one way; DO NOT force it. DO NOT twist the hose carrier while folding.

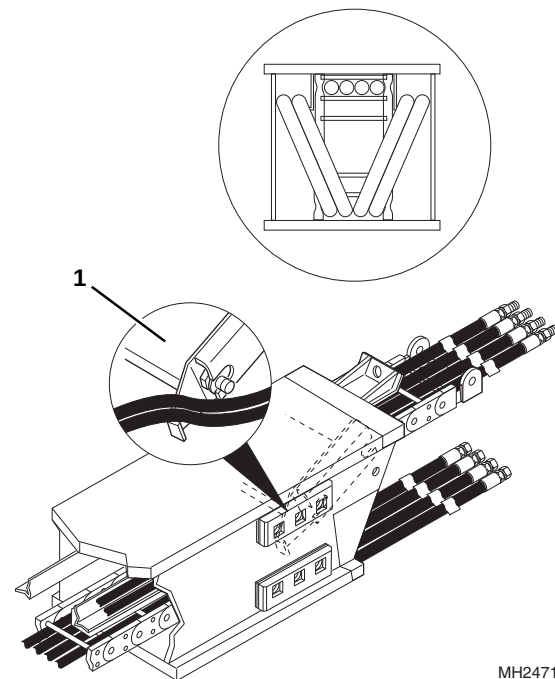


Boom



MH2411

5. Fold the hose carrier assembly in half, ensure the female ends (19) of the hoses are on the bottom, and carefully slide the folded hose carrier into the fourth boom section.
6. Line up the lower mounting holes in the hose carrier assembly with the holes in the bottom of the fourth boom section. Secure with the previously used hardware.
7. Lift the upper part of the hose carrier assembly and place the hose carrier guide under the hose carrier with the angled guides toward the front. Slide the hose guide into the fourth boom section, and place the front notches onto the rear wear pad mounting capscrew. Be sure the notch in the side of the hose guide is under the flat washer on each side of the boom.
8. Rotate the back of the hose guide up toward the top of the fourth boom section as far as it will go. Tighten the rear wear pad mounting capscrews enough to hold the hose guide.

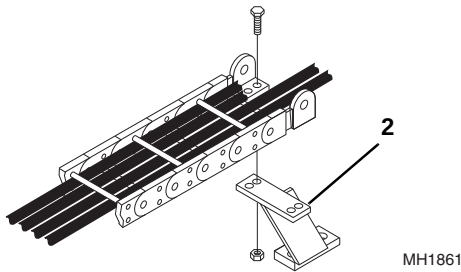
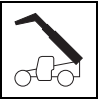


MH2471

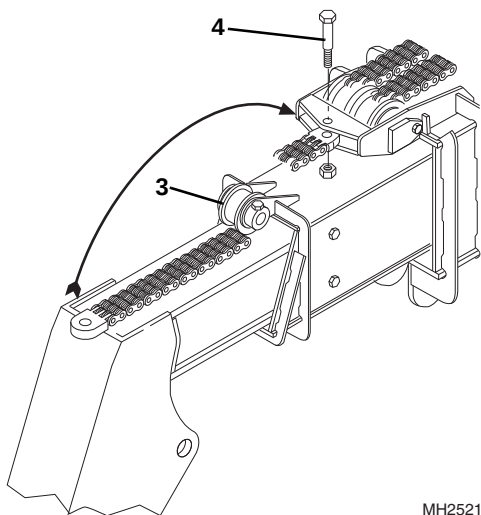
9. With the hose guide tilted up in the back, insert the female ends of the two left side hoses (from the hose carrier) one at a time over the top of the angled guide (1) on the front side of the hose guide. Push the hoses into the hose channel on the left side of the fourth boom section and down to the front of the boom section. Repeat this procedure for the two right side hoses into the hose channel on the right side of the boom.
10. Insert a capscrew through the hole in the fourth boom section. Secure the hose guide in place with a flat washer and locknut. Torque to 28 - 34 lb-ft (38 - 46 Nm).
11. Run the hose carrier out and in by hand to check for interference.

Note: DO NOT allow the hydraulic hoses to cross inside the boom.

12. At the front of the boom, pull the previously labeled hydraulic hoses out the opening in the back of the boom head. Let the hoses hang out of the boom head.
13. Grease the sections of the boom in areas where the wear pads will slide.
14. Using a suitable sling, lift the fourth boom section. While guiding the hoses into the third boom section, carefully slide the fourth boom section into the front of the third boom section.



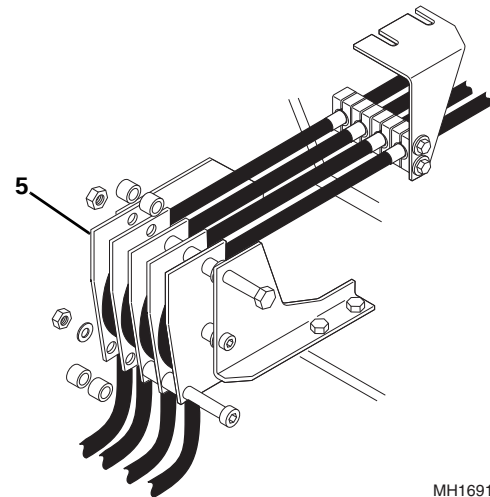
15. Reassemble the hose carrier support to the hose carrier on the right side. Install the hose carrier support (2) and lower wear pad with the previously used hardware.
16. Place the retract chain up around the retract chain sheave on the left side of the boom. Stretch the chain forward and place the clevis between the two anchor plates. Line up the hole in the clevis with the anchor plate hole location recorded during removal.
17. Insert the shoulder bolt and secure in place with a locknut. Tighten the locknut.
18. Install the side and top wear pads.
19. Place the fourth boom section extend chain sheave (3) between the mounts at the front of the third boom section. Insert the sheave pin through the mounts and the sheave. Secure in place with the previously used hardware.
20. After the sheave is assembled, apply a good grade of multi-purpose grease to the grease fitting at the end of the pin. Turn the sheave by hand to distribute grease evenly.
21. Place the fourth boom section extend chain up and around the sheave at the front of the third boom section.



22. Place the extend chain clevis between the mounting plates at the front of the second boom section. Coat the shoulder bolt (4) with anti-seize compound and insert through the plates and clevis. Secure the shoulder bolt in place with a locknut. Tighten securely, but the chain clevis should pivot freely.

Note: Keep the four hoses in line as they come out of the hose carrier assembly at the rear of the boom. DO NOT allow the hoses to cross.

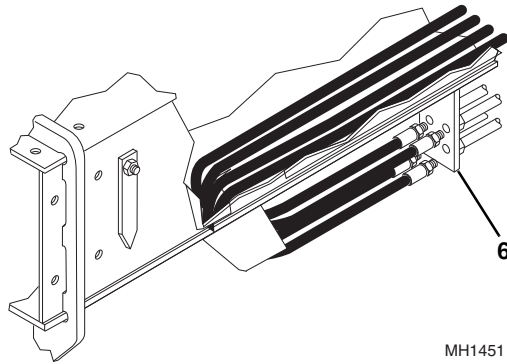
23. Install the hose clamp support bracket and top left side wear pad.
24. Position the hydraulic hoses with the edge of the tape at the hose clamps. Hold the hoses in this position, and tighten the hose clamps.



25. Assemble the hoses to the hose reel (5) at the rear of the boom.
26. Tie the strings (positioned inside the first boom section during installation) to the male end of the hydraulic hoses coming off the bottom of the hose reel assembly.
27. Working from the front of the boom, pull each hose through the boom assembly through the opening at the bottom of the first boom section.
28. Remove the strings from the hoses.



Boom



29. At the front of the first boom section, assemble the hose assemblies and tube assemblies to the mounting plate (6).

Note: Where the hose assemblies come out of the outer boom, lubricate the radius in the first boom section with soap and water to allow proper tensioning of hoses.

30. Install the quick attach and Attachment Tilt cylinder to the front of the boom. Refer to Section 3.8.4, "Quick Attach Installation."
31. Uncap and connect the previously labeled hoses to the Attachment Tilt cylinder.
32. Properly connect the battery.
33. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
34. Start the engine and operate all boom functions several times. Check the chain tension again and adjust as necessary. Check for leaks, and check the hydraulic fluid level in the tank; add fluid if required.
35. Clean up all debris, hydraulic fluid, etc., in, on, near and around the machine.
36. Install the rear cover to the boom.
37. Close and secure the rear door.

3.7 BOOM EXTEND AND RETRACT CHAINS

3.7.1 Boom Chain Inspection

WARNING

Worn pins, stretched or cracked links or corrosive environments can cause chain failure. A chain failure could result in uncontrolled boom movement, loss of load or machine instability.

Under normal operating conditions the boom chains will need to be inspected every 250 hours of operation. The retract chains need to be exposed and inspected every 1000 hours of operation. Environmental conditions and dynamic impulse/shock loads can drastically affect normal operating conditions and require more frequent inspection intervals.

Environments in which material handling machines operate can vary widely from outdoor moisture to temperature to mildly corrosive or highly corrosive industrial atmospheres, in addition to abrasive exposures such as sand and grit. Some effects can be as follows:

- Moisture - Corrosive rusting reduces chain strength by pitting and cracking.
- Temperature - Low temperature reduces chain strength by embrittlement. Going in and out of cold storage results in moisture from condensation.
- Chemical Solutions or Vapors - Corrosive attack on the chain components and/or the mechanical connections between the chain components. Cracking can be (and often is) microscopic. Going from microscopic cracking to complete failure can be either abrupt or may require an extended period of time.
- Abrasives - Accelerated wearing and scoring of the articulating members of the chain (pins and plates), with a corresponding reduction in chain strength. Due to the inaccessibility of the bearing surfaces (pin surfaces and plate apertures), wear and scoring are not readily noticeable to the naked eye.



Following are some examples of dynamic shock loading which can impose abnormal loads above the endurance limit of a leaf chain.

- High velocity movement of load, followed by sudden, abrupt stops.
- Carrying loads in suspension over irregular surfaces such as railroad tracks, potholes, and rough terrain.
- Attempting to “inch” loads which are beyond the rated capacity of the machine.

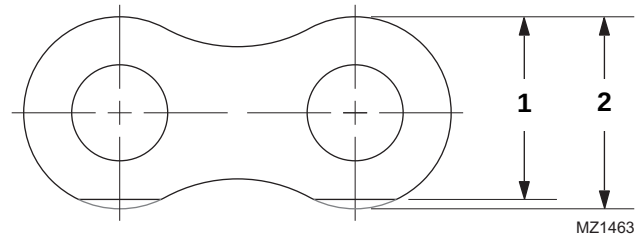
The above load cycles and environmental conditions make it impossible to predict chain life. It is therefore necessary to conduct frequent inspections until replacement life can be predicted.

The boom chain's normal life expectancy can be expressed as a maximum percent of elongation. This is generally 3%. As the chain flexes back and forth over the sheave, the bearing joints (pins and inside link plates) gradually incur wear due to articulation.

3.7.2 Inspection Guidelines

1. Park the machine on a firm, level surface, raise the boom to a horizontal (level) position, place the transmission control lever in (N) NEUTRAL, engage the park brake switch.
2. Fully extend the boom until the extend chain is taut. Shut the engine off.
3. The extend chains will be visible for inspection with the machine in this state.
4. While doing the chain inspection, check all chain clevis ends for distortion or cracking and sheaves for bearing wear or grooving from the chain.
5. Inspect the retract chains every 1000 hours of operation.
6. Inspect the chains for the following conditions:

Edge Wear

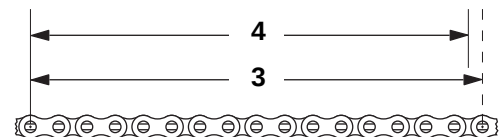


Check the chain for wear on the link plate edges caused by running back and forth over the sheave. The maximum reduction of material should not exceed 5%. Measure and compare to a normal link plate height by measuring a portion of chain that does not run over the sheave. If the measured plate height (1) is 5% less than the normal plate height (2), discard and replace the chain.

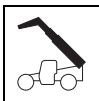
Elongation

It is important to measure the chain in the section that moves over the sheaves because it receives the most frequent articulation. Measuring the chain near its clevis terminals could give an inaccurate reading. The ends of the chains, near the clevis terminal, will not have flexed as frequently, if at all, as the middle of the chains.

It is best to measure in 12 pin increments from pin center to pin center. For example, if the links are one inch from pin center to pin center, the distance should be 12 in (305 mm). If the links are 3/4 in (19,0 mm) apart, the distance after 12 pins should be 9 in (228,6 mm).

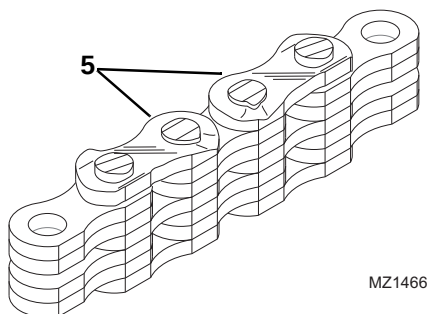


If the distance measured (3) is 3% greater than the normal length (4), discard and replace the chain.



Boom

Distorted or Battered Link Plates

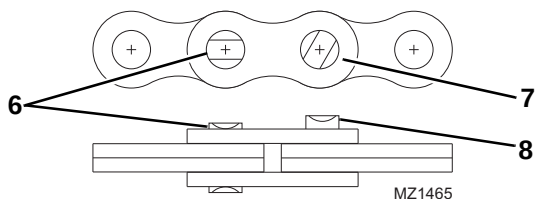


MZ1466

Distorted or battered link plates (5) on a leaf chain can cause tight joints and prevent flexing.

Turning or Protruding Pins

Highly loaded chain, operating with inadequate lubrication can generate abnormal frictional forces between pin and link plates. When chain is allowed to operate in this condition, a pin or series of pins, can begin to twist out of a chain, resulting in failure.



MZ1465

Examine the pin head rivets to determine if the "VEE" flats are still in correct alignment (6). Chain with rotated/displaced heads (7) or abnormal pin protrusion (8) should be replaced immediately.

DO NOT attempt to repair the chain by welding or driving the pin(s) back into the chain. Once the press fit integrity between outside plates and pins has been altered, it cannot be restored.

Any wear pattern on the pin heads or the sides of the link plates indicates misalignment in the system. This condition damages the chain as well as increases frictional loading and should be corrected.

Cracked Plates

Inspect the chains very carefully, front and back as well as side to side, for any evidence of cracked plates. If any one crack is discovered, the chain should be replaced in its entirety.

It is important, however to determine the cause of the crack before installing a new chain so the condition does not repeat itself.

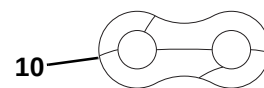
The types of cracks are:

- **Fatigue Cracking** - Fatigue cracks (9) are a result of repeated cyclic loading beyond the chain's endurance limit.



MZ1467

- **Stress Corrosion Cracking** - The outside link plates are particularly susceptible to stress corrosion cracking (10).

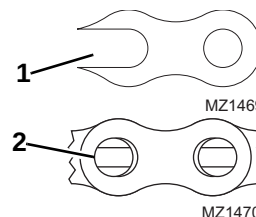


MZ1468

- **Corrosion Fatigue Cracking** - Corrosion fatigue cracks are very similar to fatigue cracks in appearance. Corrosion fatigue is the combined action of an aggressive environment and cyclic stress.

Other Modes of Failure

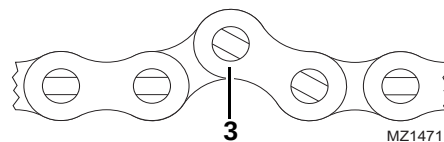
- **Ultimate Strength Failure** - These types of failures are caused by overloads far in excess of the design load. Either fractured plates (1) or enlarged holes (2) can occur. If either of these failures occurs, the chain should be replaced immediately.



MZ1469

MZ1470

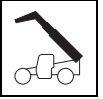
- **Tight Joints** - All joints in the chain should flex freely. Tight joints (3) resist flexing.



MZ1471

If the problem is caused by dirt or foreign substance packed in the joints, clean and lubricate thoroughly before re-installing the chain.

If the problem is caused by corrosion and rust or bent pins, replace the chain.



3.7.3 Expose Chains for Inspection

f. Extend Chains

1. Park the machine on a firm, level surface. Place the transmission control lever in (N) NEUTRAL, engage the park brake switch and raise the boom to a horizontal (level) position.
2. Fully extend the boom and shut the engine OFF.

The extend chains will be visible for inspection with the machine in this state.

While doing the chain inspection, check all chain clevis ends for distortion or cracking and sheaves for bearing wear or grooving from the chain.

If during the inspection, any chain is found to be damaged or stretched, the chain must be replaced. It is recommended that when any chain is replaced, that all the chains and clevises be replaced at the same time.

g. Retract Chains

The retract chains are only partially visible through the rear of the boom with all the sections retracted. It is possible to see a section of the retract chain as the boom is slowly extended. If there is ANY question that one or all the retract chains are damaged, the boom should be removed and disassembled with the retract chains being inspected and replaced if necessary.

Note: DO NOT attempt to repair a chain. Replace a stretched or damaged chain with a new part. Always replace both the chain and the clevis. It is recommended that when any chain is replaced, that all chains and clevises be replaced at the same time.

3.7.4 Chain Lubrication

After inspection and before being returned to service, chains must be lubricated with Mystik Tetrimoly Grease.

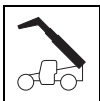
The lubricant must penetrate the chain joint to prevent wear. Applying lubricant to the external surfaces will prevent rust, but the chains should be articulated to make sure the lubricant penetrates to the working surfaces between the pins and links.

To prepare the chain for lubrication, the chain plates should be brushed with a stiff brush or wire brush to clear the space between the plates so that lubricant can penetrate to the working surfaces.

Lubricant may be applied with a narrow paint brush or directly poured on, but the chain should be well flooded with lubricant and the boom should be extended and retracted to be sure that the lubricant penetrates to the working surfaces. All surplus lubricant should be wiped away from the external surfaces. DO NOT use a solvent for this wiping operation.

Regular application of lubricant is necessary to make sure that all working surfaces are adequately lubricated. In extremely dusty conditions, it may be necessary to lubricate the chains more often. Refer to Section 2.5, "Service and Maintenance Schedules," and Section 2.6, "Lubrication Schedules," for detailed information.

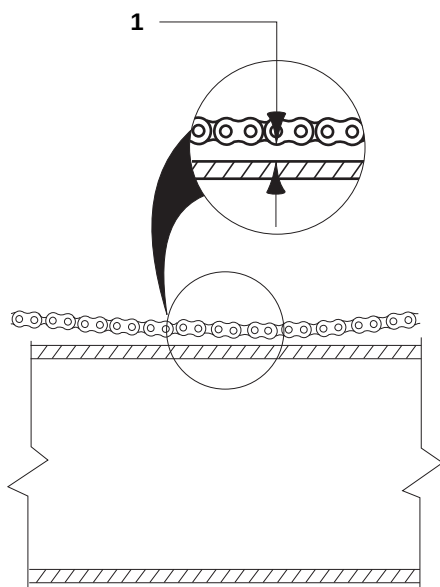
Lubrication of chains on machines working consistently in extreme hot or cold conditions requires special consideration. It is important that a reputable lubrication specialist or a JLG distributor be consulted for guidance.



Boom

3.7.5 Boom Chain Tension Check

1. Make sure the attachment is attached to the boom head before doing the tension check.
2. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch and level the boom.
3. Slowly, fully extend the boom and retract it about halfway. Fully extend the boom, then retract it 2 in (51 mm) (one inch per section). Turn the engine OFF.



OA0493

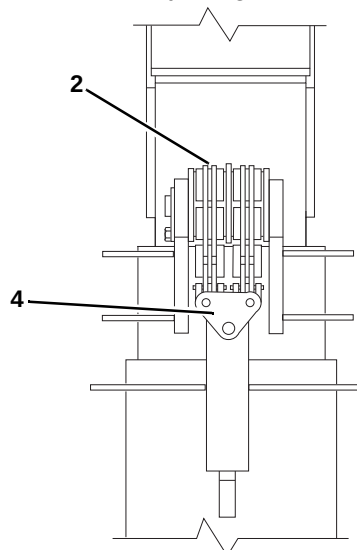
4. Measure the sag (1) in each of the boom extend chains between the bottom of the extend chains and the top of the boom at their closest point. Acceptable boom chain sag is between 1.5 in (38 mm) and 2.5 in (64 mm) for the 8042 & 10042 and between 2.85 in (72 mm) and 3.85 in (98 mm).

If the measurement is either less than, or greater than the range given, the boom chains need to be adjusted. Continue with Section 3.7.6, "Boom Chain Tension Adjustment (6036, 6042, 8042 & 10042)" or Section 3.7.7, "Boom Chain Tension Adjustment (10054)," to adjust the chain system.

5. Start the engine, retract the boom completely and turn the engine OFF.

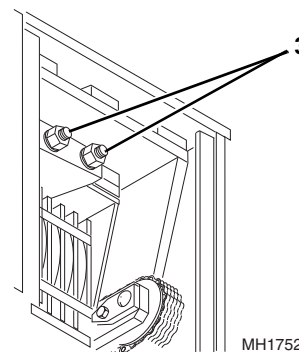
3.7.6 Boom Chain Tension Adjustment (6036, 6042, 8042 & 10042)

Note: Always perform Section 3.7.5, "Boom Chain Tension Check" before adjusting the boom chain tension.



OH0241

1. Adjust the two boom extend chains (2).

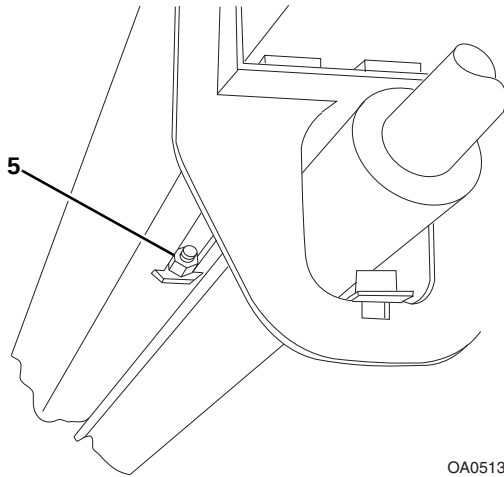


MH1752

If the chain sag measurement (1) is less than 1.5 in (38 mm), tighten the two extend chain adjustment locknuts (3).

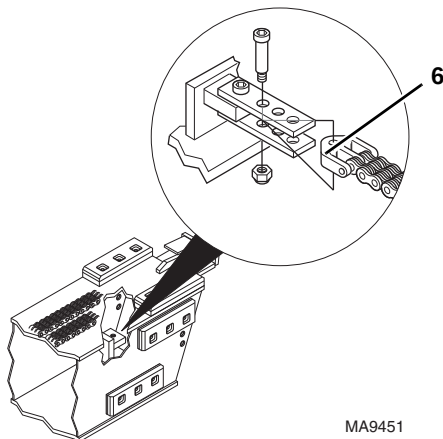
If the chain sag measurement is more than 2.5 in (64 mm), loosen the two extend chain adjustment locknuts.

2. Tighten or loosen the two extend chain adjustment locknuts located at the rear of the boom. Be sure each of the locknuts are adjusted equally so that each extend chain maintains the same tension. Equal chain tension can be checked by the position of the yoke (4) on the outer boom. The front of the yoke should be parallel with the front edge of the outer boom.



OA0513

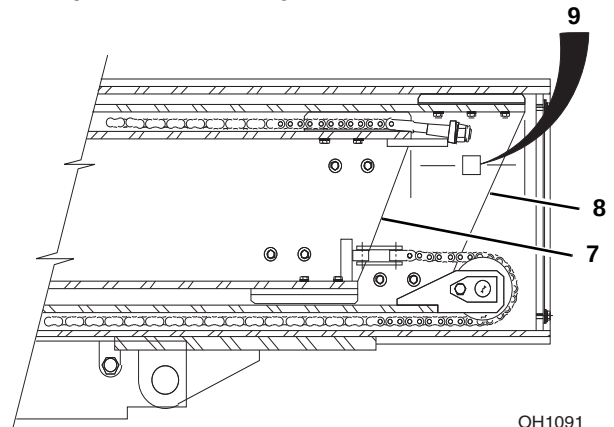
3. If there is no adjustment left on the extend chains, tighten the retract chain locknut (5) at the front on the underside of the outer boom.
4. Recheck chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."



MA9451

5. Further chain adjustment can be achieved by loosening all three chain locknuts and moving the rear retract chain clevis (6) from the original mounting hole in the anchor plate to the next hole. This is only acceptable when boom chain sag cannot be acquired and the chain elongation measurement is still less than 12.36 in (313 mm). Follow the instructions in Section 3.7.6, a. "Component/Assembly Verification."
6. Recheck chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."

a. Component/Assembly Verification



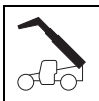
OH1091

The third (7) to second (8) boom section separation should be checked when assembling new boom sections or chains, or when the rear retract chain clevis has been moved forward on the anchor plate.

Measure the separation (9) between the third and second boom section top plates. The distance should be at least 8.5 in (216 mm) and not greater than 11 in (279 mm) with the boom fully retracted and the chains properly tensioned. A distance of less than 8.5 in (216 mm) could result in interference and cause damage to boom components.

If the distance is less than 8.5 in (216 mm) or greater than 11 in (279 mm):

1. Verify that the retract chain clevis (6) is not mounted in the last hole in the anchor plate.
2. Make sure that the chain system is properly tensioned. Refer to Section 3.7.5, "Boom Chain Tension Check."
3. **To increase the separation distance:** Loosen the retract chain locknut (5) on the bottom of the boom one or two turns and tighten the two extend chain locknuts equally the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.
4. **To decrease the separation distance:** Loosen the extend chain locknuts at the rear of boom equally one or two turns and tighten the retract chain locknut (5) the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.
5. Install the rear boom cover.
6. If the third to second boom separation distance cannot be achieved, contact your local **JLG** service distributor.

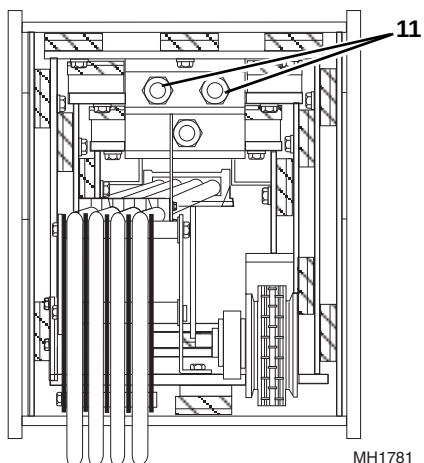
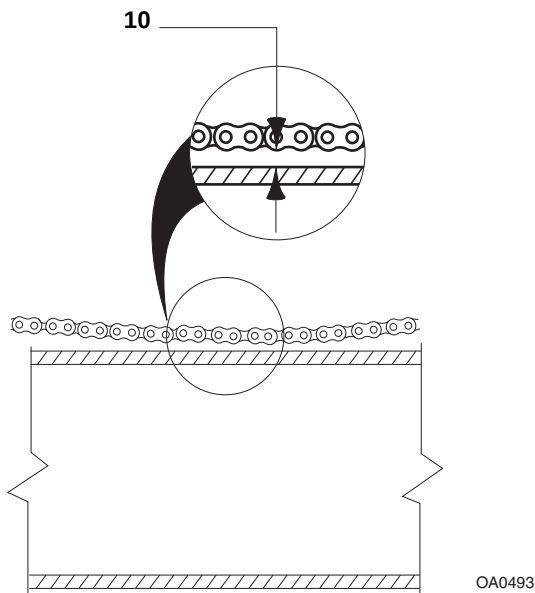


Boom

3.7.7 Boom Chain Tension Adjustment (10054)

a. Outer Boom Chains Tension Adjustment

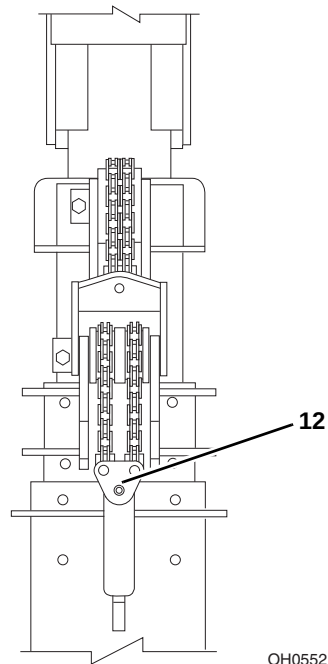
Note: Always perform Section 3.7.5, "Boom Chain Tension Check," before adjusting the boom extend chain tension.



1. Adjust the two second and third boom section extend chains.

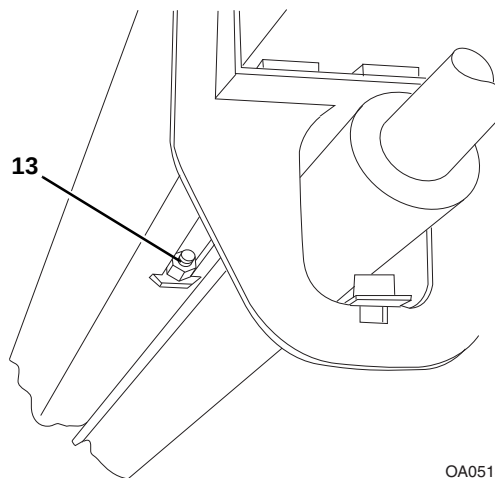
If the chain sag measurement (10) is less than 2.85 in (72 mm), tighten the two extend chain adjustment locknuts (11).

If the chain sag measurement (10) is more than 3.85 in (98 mm), loosen the two extend chain adjustment locknuts (11).

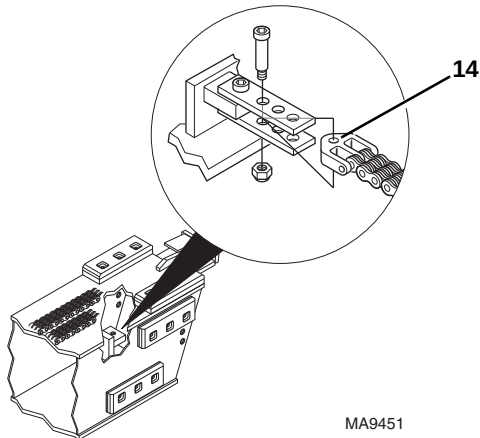


2. Tighten or loosen the two extend chain adjustment locknuts (11) located at the rear of the boom. Be sure each of the locknuts are adjusted equally so that each extend chain maintains the same tension.

Equal chain tension can be checked by the position of the yoke (12) on the first boom section. The front of the yoke should be parallel with the front edge of the outer boom.



3. If there is no adjustment left on the extend chains, tighten the retract chain locknut (13) at the front on the underside of the boom.
4. Recheck chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."



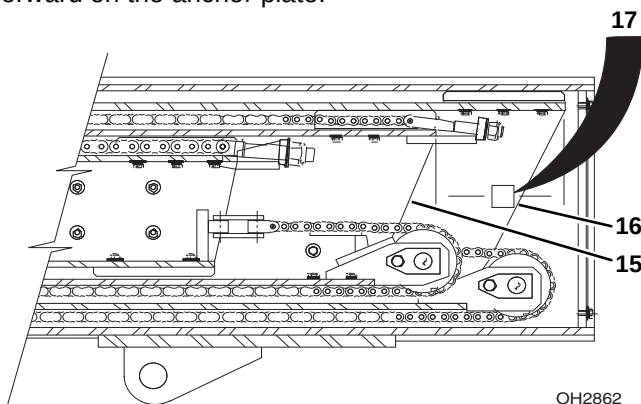
5. Further chain adjustment can be achieved by loosening all three chain locknuts and moving the rear retract chain clevis (14) from the original mounting hole in the anchor plate to the next hole.

This is only acceptable when boom chain sag cannot be acquired and the chain elongation measurement is still less than 12.36 in (313 mm). Follow the instructions in Section 3.7.7, b. "Component/Assembly Verification."

6. Recheck chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."

b. Component/Assembly Verification

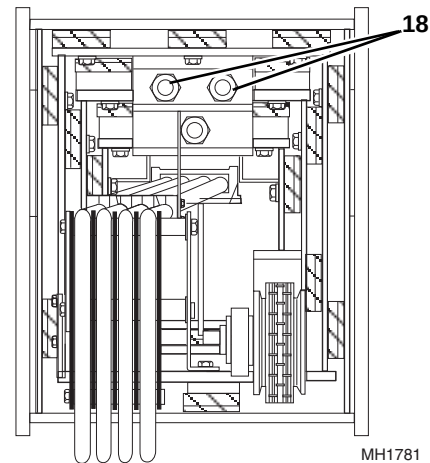
The third to second boom section separation should be checked when assembling new boom sections or chains, or when the rear retract chain clevis has been moved forward on the anchor plate.



Measure the separation between the third (15) and second (16) section boom top plates. The distance (17) should be at least 8.5 in (216 mm) and not greater than 11 in (279 mm) with the boom fully retracted and the chains properly tensioned. A distance of less than 8.5 in (216 mm) could result in interference and cause damage to boom components.

If the distance is less than 8.5 in (216 mm) or greater than 11 in (279 mm):

1. Verify that the retract chain clevis is not mounted in the last hole in the anchor plate.
2. Make sure that the chain system is properly tensioned. Refer to Section 3.7.5, "Boom Chain Tension Check."



3. **To increase the separation distance:** Loosen the retract chain locknut (13) on the bottom of the boom one or two turns and tighten the two extend chain locknuts (18) equally the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.
4. **To decrease the separation distance:** Loosen the extend chain locknuts (18) at the rear of boom equally one or two turns and tighten the retract chain locknut (13) the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.

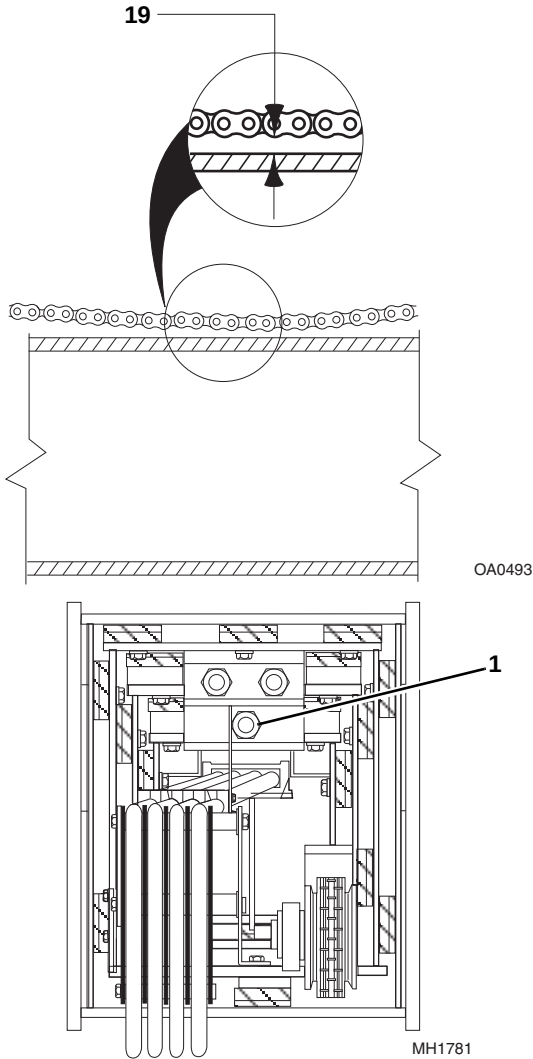
Note: If the third to second boom section separation distance cannot be achieved, contact your local authorized service distributor.



Boom

c. Inner Boom Chain Tension Adjustment

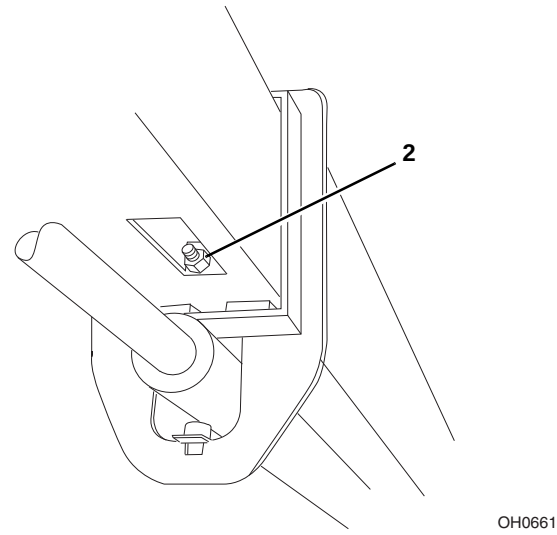
Note: Always perform the Section 3.7.5, “Boom Chain Tension Check,” before adjusting the fourth boom section extend chain tension.



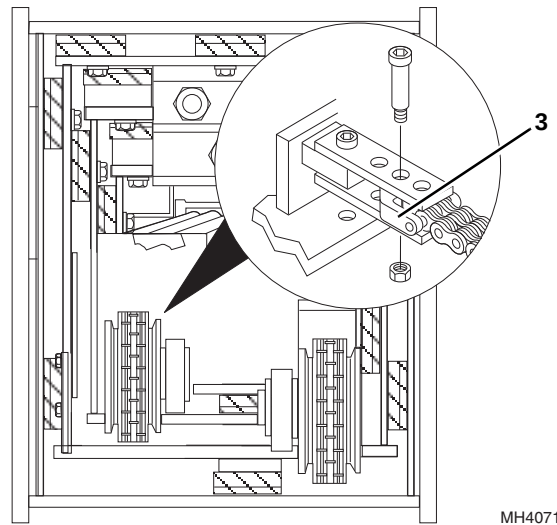
1. Adjust the fourth boom section extend chain:

If the chain sag measurement (19) is less than 2.85 in (72 mm), tighten the extend chain adjustment locknut (1).

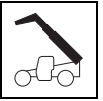
If the chain sag measurement (19) is more than 3.85 in (98 mm), loosen the extend chain adjustment locknut (1).



2. If there is no adjustment left on the extend chains, tighten the retract chain locknut (2) on the bottom of the second boom section several turns.
3. Recheck chain tension. Refer to Section 3.7.5, “Boom Chain Tension Check.”

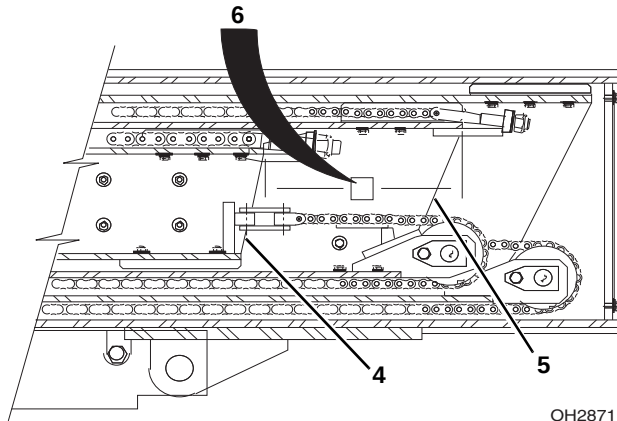


4. Further chain adjustment can be achieved by loosening both chain locknuts and moving the rear retract chain clevis (3) from the original mounting hole in the anchor plate to the next hole.
This is only acceptable when boom chain sag cannot be acquired and the chain elongation measurement is still less than 12.36 in (313 mm). Follow the instructions in Section 3.7.7, d. “Component/ Assembly Verification.”
5. Recheck chain tension. (Refer to Section 3.7.5, “Boom Chain Tension Check.”)



d. Component/Assembly Verification

The fourth to third boom section separation should be checked when assembling new boom sections or chains, or when the rear retract chain clevis has been moved forward on the anchor plate.



Measure the separation between the third (4) and fourth (5) boom section top plates. The distance (6) should be at least 13.75 in (349 mm) and not greater than 14.25 in (362 mm) with the boom fully retracted and the chains properly tensioned. A distance of less than 13.75 in (349 mm) could result in interference and cause damage to boom components.

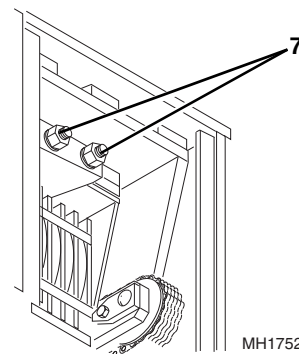
If the distance is less than 13.75 in (349 mm) or greater than 14.25 in (362 mm):

1. Verify that the retract chain clevis is not mounted in the last hole in the anchor plate.
2. Make sure that the chain system is properly tensioned. Refer to Section 3.7.5, "Boom Chain Tension Check"
3. **To increase the separation distance:** Loosen the retract chain locknut on the bottom of the second boom section one or two turns and tighten the extend chain locknut the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.
4. **To decrease the separation distance:** Loosen the extend chain locknut at the rear of boom one or two turns and tighten the retract chain locknut on the bottom of the second boom section the same number of turns. A minimum of one full thread on the clevis must protrude beyond the collar of the locknut.

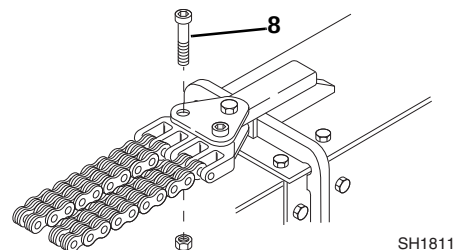
Note: If the fourth to third boom section separation distance cannot be achieved, contact your local authorized service distributor.

3.7.8 Extend Chains Removal and Replacement (6036, 6042, 8042 & 10042)

1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.



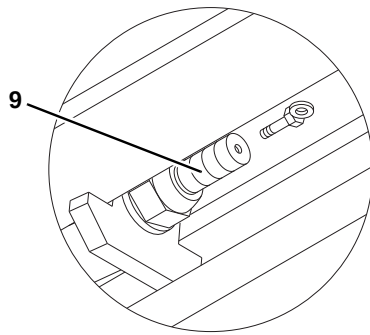
5. At the rear of the boom, locate the extend chain locknuts (7). Record the amount of threads extending beyond both the locknuts. These measurements will be the starting point for adjustment of the extend chains after installation.
6. Remove and replace the extend chains one at a time. Remove the right side locknut and flat washer, holding the clevis to the anchor plate.



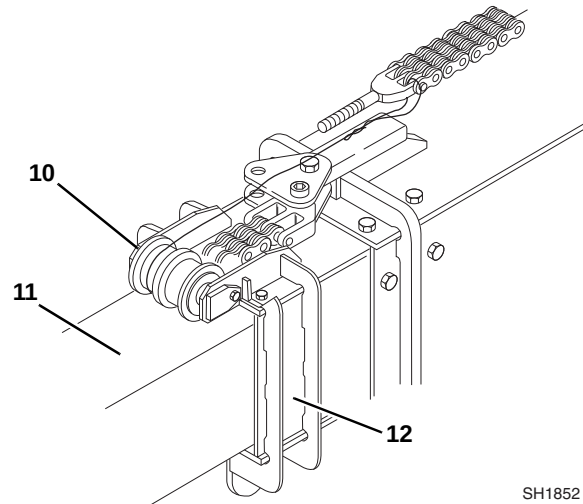
7. At the front of the boom, remove the capscrew (8) and locknut holding the right side extend chain clevis to the yoke plates. Replace the capscrew if damaged or worn.



Boom



MH6510



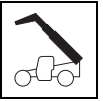
SH1852

8. At the rear of the boom, attach one end of a wire to the threaded clevis (9) on the right side extend chain using a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.
9. Have an assistant pull the chain from the front of the boom while guiding the wires into the boom from the rear. Remove the wire from the clevis, but not from inside the boom.
10. Inspect wear and condition of the booms, chains, clevis', chain sheaves, Extend/Retract cylinder, chain rods, clevis anchors and all mounting hardware. Replace any worn or damaged parts. DO NOT attempt to make any repairs to the chain.

Note: Chains and clevis' are wear items and experience the same stress. DO NOT attempt to repair a chain. Replace a stretched or damaged chain with a new part. Always replace both the chain and the clevis'.

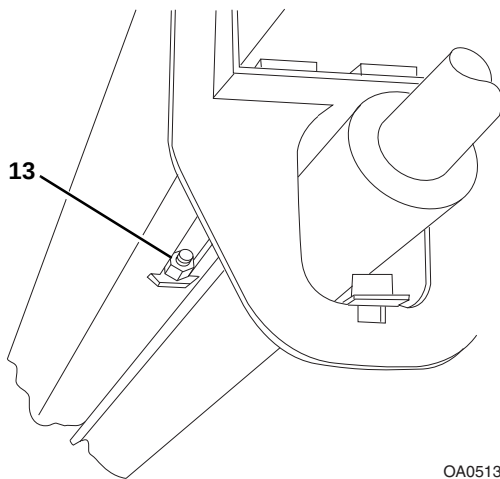
11. Coat the threads of the threaded clevis with multi-purpose grease.
12. Lay the new extend chain on top of the first boom section with the threaded clevis toward the front of the boom.
13. Attach the wire to the threaded clevis of the new extend chain using a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.

14. Pull the extend chain forward and place over the right side of the chain sheave (10). Guide the wire and the threaded clevis under the chain sheave, and between the top of the third boom section (11) and the second boom section (12).
15. Have an assistant guide the extend chain into the front of the boom, while pulling on the wire from the rear of the boom. Guide the threaded clevis into the hole in the anchor plate.
16. Assemble the flat washer and locknut to the threaded clevis. Thread the locknut until the threads are flush with the top of the nut.
17. Pull the anchor clevis up around the double chain sheave and position the clevis between the yoke plates.
18. Coat the capscrew with anti-seize compound. Insert the capscrew through the yoke plates and clevis and secure in place with a locknut. Tighten securely; but the chain must pivot freely.
19. Remove the wire from the clevis.
20. Repeat this procedure for the left side extend chain.
21. At the rear of the boom, tighten the two locknuts on the extend chain clevis' until the amount of threads protruding beyond each locknut is the same as the measurement recorded during removal of the chains.
22. Check and adjust boom chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."
23. Install the boom rear cover.
24. Properly connect the battery.
25. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.



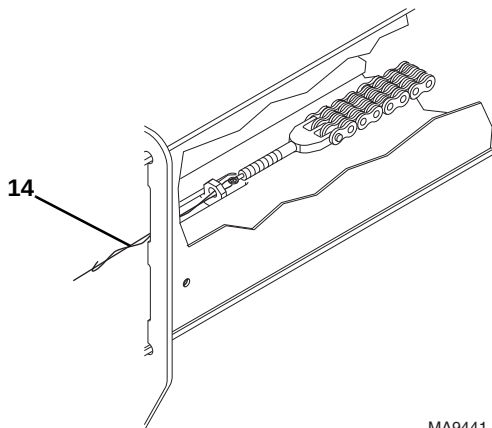
3.7.9 Retract Chain Removal and Replacement (6036, 6042, 8042 & 10042)

1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.



OA0513

5. At the front underside of the boom, record the amount of threads extending beyond the locknut (13). This measurement will be the starting point for adjustment of the boom retract chain.
6. At the front underside of the boom, loosen the locknut far enough that it can be removed by hand.



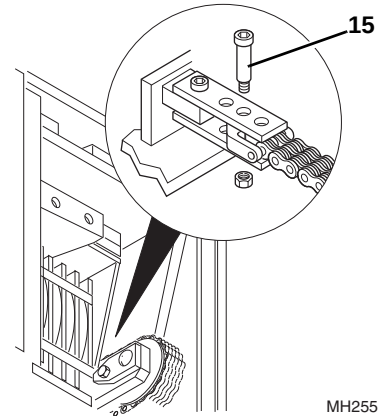
MA9441

7. Attach a wire or string (14) to the threaded clevis with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat

washer must be smaller than the diameter of the threads on the clevis. The wire or string will be used to pull the chain back through the boom during reassembly.

8. Remove the locknut and flat washer holding the retract chain threaded clevis to the mounting tab.

Note: Record the location of the shoulder bolt to ensure correct installation.



MH2551

9. At the rear of the boom, locate the two retract chain anchor plates holding the retract chain to the third boom section just in front of the retract chain sheave. Remove the locknut and shoulder bolt (15) holding the retract chain clevis to the anchor plates. The two anchor plates can remain in place on the third boom section.
10. From the rear of the boom, pull the retract chain out of the rear of the boom.
11. Inspect wear and condition of the booms, chains, clevis', chain sheaves, Extend/Retract cylinder, chain rods, clevis anchors and all mounting hardware. Replace a worn or damaged chain. DO NOT attempt to make any repairs to the chain.

Note: Chains and clevis' are wear items and experience the same stress. DO NOT attempt to repair a chain. Replace a stretched or damaged chain with a new part. Always replace both the chain and the clevis'.

12. Remove the string from the old chain and attach it to the new clevis.
13. Coat the threads of the threaded clevis with multi-purpose grease.



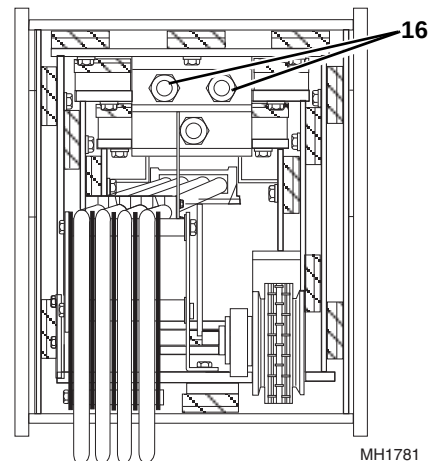
Boom

14. From the rear of the boom, have an assistant push the threaded clevis end of the chain under the chain sheave and down between the second and first boom sections. Pull the front clevis using the string or wire. Keep the chain to the right side of the boom, push the threaded clevis down to the tab at the front underside of the first boom section.
15. Have an assistant guide the threaded end of the clevis through the hole in the tab.
16. Remove the string or wire from the end of the clevis.
17. Reassemble the flat washer and locknut onto the threaded clevis. Tighten the locknut until the threaded end of the clevis is flush with the top of the locknut.
18. At the rear of the boom, place the retract chain up and over the chain sheave. Place the clevis between the two anchor plates.
19. If re-installing a used chain, insert the saved shoulder bolt, in the same position in the plates and clevis recorded during removal.
20. If installing a new chain, line up the hole in the clevis with the second hole from the rear of the anchor plates. Insert the shoulder bolt, saved during removal of the old chain.
21. Secure the shoulder bolt in place with a locknut. Tighten the locknut securely.
22. Tighten the locknut on the retract chain clevis until the amount of threads protruding beyond the locknut is the same as the measurement recorded during removal of the retract chain.
23. Check and adjust retract chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."
24. Install the boom rear cover.
25. Properly connect the battery.
26. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

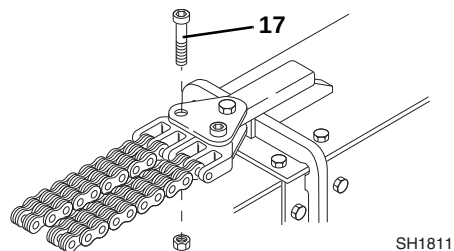
3.7.10 Extend Chains Removal and Replacement (10054)

a. Second and Third Boom Section Extend Chains Removal and Replacement

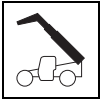
1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.



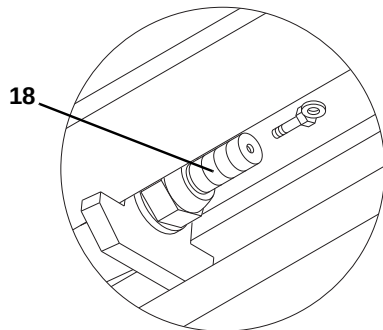
5. At the rear of the boom, locate the extend chain locknuts (16). Record the amount of threads extending beyond the locknuts. This measurement will be the starting point for adjustment of the extend chains after installation.
6. Remove and replace the boom extend chains one at a time. Remove the right side locknut and flat washer holding the right side chain clevis to the anchor plate.



7. At the front of the first boom section, remove the capscrews (17) and locknuts holding the extend chain clevis' to the yoke plates.

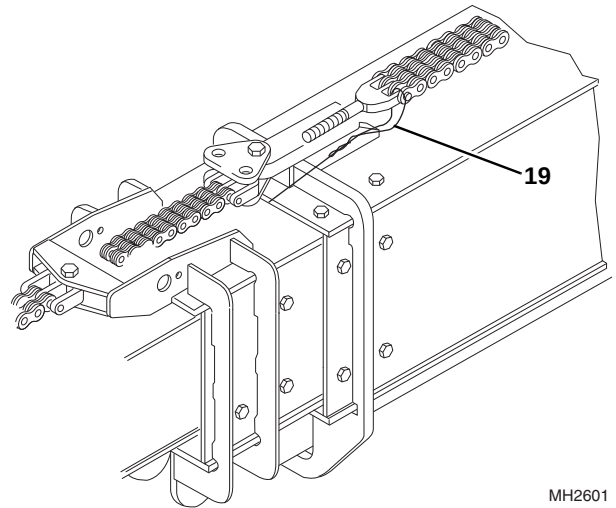


8. Inspect the capscrews for signs of wear or damage. Replace with new capscrews if damaged or worn.
9. At the front of the second boom section, remove the capscrew and lockwasher holding the extend chain sheave pin to the sheave mount bracket. Remove the pin from the mount bracket and the extend chain sheave. Remove the extend chain sheave from the mount.



MH6510

10. At the rear of the boom, attach one end of a wire to the threaded clevis (18) on the right side extend chain with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.
11. Have an assistant pull the chain from the front of the boom while guiding the wire into the boom from the rear. Remove the wire from the clevis, but not from inside the boom.
12. Coat the threads of the threaded clevis with multi-purpose grease.
13. Lay the new extend chain on top of the first boom section with the threaded clevis toward the front of the boom.
14. Attach the wire to the threaded clevis of the new extend chain using a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.



MH2601

15. Pull the extend chain forward and place in between the chain sheave mounts. Guide the wire (19) and the threaded clevis into the boom by placing the threaded clevis between the top of the third boom section and the second boom section.
16. Have an assistant guide extend chain into the front of the boom while pulling the wire and threaded clevis toward the rear of the boom. Guide the threaded clevis into the hole in the anchor plate.
17. Place the flat washer onto the threaded end of the threaded clevis and assemble the locknut. Thread locknut onto the threaded clevis until the threads are flush with the top of the nut.
18. Remove the wire from the clevis.
19. Repeat this procedure for the left side extend chain.
20. After both of the chains are replaced inside the boom, assemble the double sheave to the mount at the front of the second boom section.
21. Place the double extend chain sheave between the mounts and under the extend chains at the front of the second boom section. Insert the sheave pin through the mounts and the double sheave. Line up the mounting hole in the sheave pin with the threaded hole in the sheave mount and secure in place with the capscrew and the lockwasher. Tighten securely.
22. Pull the anchor clevis' up around the double chain sheave and position the clevis' one at a time between the yoke plates.
23. Coat the capscrews with anti-seize compound. Insert the capscrews through the yoke plates and clevis' and secure in place with locknuts. Tighten each locknut securely, but the chain clevis' must pivot freely.

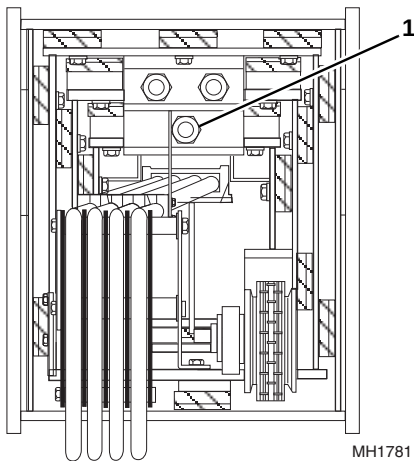


Boom

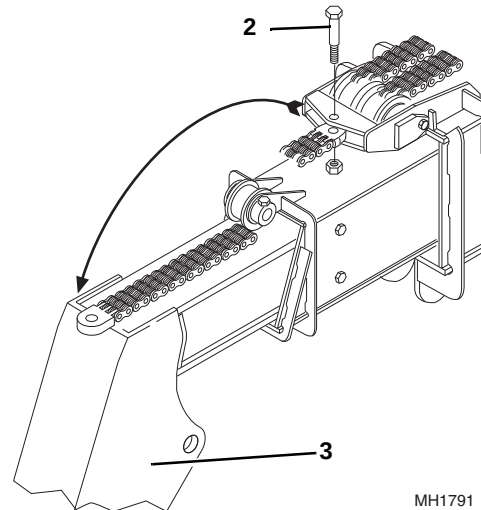
24. At the rear of the boom, tighten the two locknuts on the chain clevis' until the amount of threads protruding beyond each locknut is the same as the measurement recorded during removal of the extend chains.
25. Check and adjust the retract chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."
26. Install the boom rear cover.
27. Properly connect the battery.
28. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

b. Fourth Boom Section Extend Chains Removal and Replacement

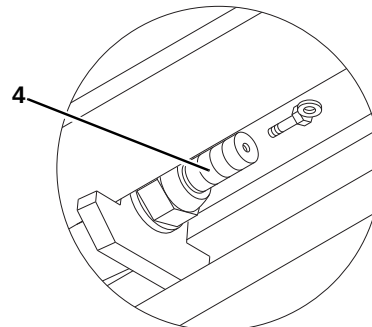
1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.



5. At the rear of the boom, locate the extend chain locknut (1). Record the amount of threads extending beyond the locknut. This measurement will be the starting point for adjustment of the extend chain after installation.
6. Remove the locknut and flat washer holding the extend chain clevis to the anchor plate on the boom.



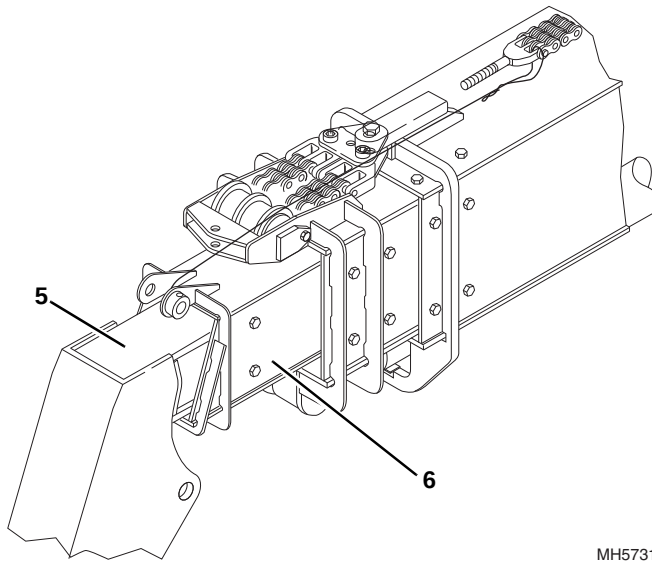
7. At the front of the boom, disconnect the extend chain clevis from the anchor plates on the second boom section. Remove the locknut holding the shoulder bolt (2) to the anchor plates. Pull the extend chain clevis from between the plates and lay over the front of the fourth boom section (3).
8. Remove the locknut and capscrew holding the extend chain sheave to the front of the third boom section.
9. Inspect the sheave pin for corrosion or damage. If the pin is damaged, it should be replaced. Minor corrosion can be repaired with fine emery cloth. Save the chain sheave, pin and capscrew.



10. At the rear of the boom, attach one end of a wire to the threaded clevis (4) on the extend chain with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.
11. Have an assistant pull the chain from the front of the boom while guiding the wire into the boom from the rear. Remove the wire from the clevis, but not from inside the boom.



12. Coat the threads of the threaded clevis with multi-purpose grease.
13. Lay the new extend chain on top of the fourth boom section with the threaded clevis toward the front of the boom.
14. Attach the wire to the threaded clevis of the new extend chain with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.



MH5731

15. Pull the extend chain forward and place in between the chain sheave mounts. Guide the wire and the threaded clevis into the boom by placing the threaded clevis between the third boom section (5) and the top of the fourth boom section (6).
16. Have an assistant guide the extend chain into the front of the boom while pulling the wire and threaded clevis into the hole in the anchor plate.
17. Place the flat washer onto the threaded end of the threaded clevis and assemble the locknut. Thread the locknut onto the threaded clevis until the threads are flush with the top of the nut.
18. Remove the wire from the clevis.
19. After the chain is replaced inside the boom, assemble the sheave to the mount at the front of the third boom section.
20. Place the extend chain sheave between the mounts at the front of the third boom section. Insert the sheave pin through the mounts and the sheave. Secure in place with the capscrew, saved, and a locknut. Tighten securely.

21. After the sheave is assembled, apply a good grade of multi-purpose grease to the grease fitting at the end of the pin. Turn the sheave by hand to distribute the grease evenly.
22. Pull the extend chain up and around the sheave at the front of the third boom section.
23. Place the extend chain clevis between the mounting plates at the front of the third boom section. Coat the saved shoulder bolt with anti-seize compound and insert through the plates and clevis. Secure the shoulder bolt in place with a locknut. Tighten securely, but the chain clevis should pivot freely.
24. At the rear of the boom, tighten the locknut on the extend chain clevis until the amount of threads protruding beyond the locknut is the same as the measurement recorded during removal of the extend chain.
25. Check and adjust the extend chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."
26. Install the boom rear cover.
27. Properly connect the battery.
28. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

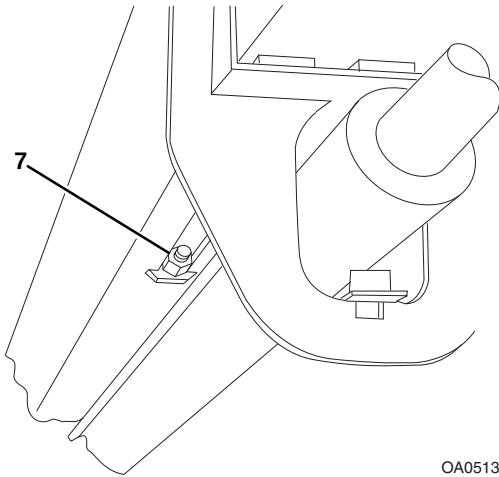
3.7.11 Retract Chain Removal and Replacement (10054)

c. Third Boom Section Retract Chain Removal and Replacement

1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.



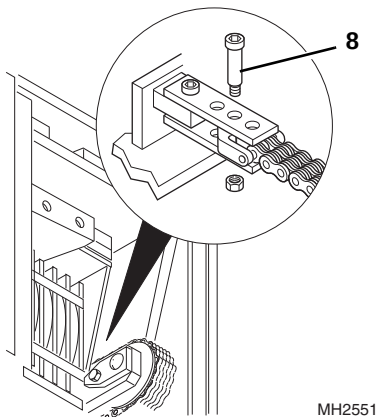
Boom



OA0513

5. At the front underside of the boom, locate the retract chain locknut (7). Record the amount of threads extending beyond the locknut. This measurement will be the starting point for adjustment of the retract chain after installation.
6. At the front underside of the fourth boom section, remove the locknut and flat washer holding the retract chain threaded clevis to the mounting tab.
7. Attach a wire or string to the threaded clevis with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis. The wire or string will be used to pull the chain back through the boom during reassembly.

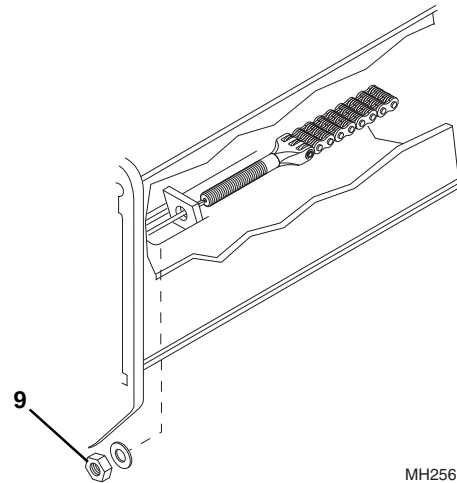
Note: Record the location of the shoulder bolt to ensure correct installation.



MH2551

8. At the rear of the boom, locate the two retract chain anchor plates. Remove the locknut and shoulder bolt (8) holding the retract chain clevis to the anchor plates. The two anchor plates can remain in place on the third boom section.

9. From the rear of the boom, pull the boom retract chain out of the rear of the boom.
10. Disconnect the string or wire from the retract chain clevis, and allow it to hang out the rear of the boom.
11. Coat the threads of the threaded clevis with multi-purpose grease.
12. At the rear of the boom, attach the string or wire to the new retract chain threaded clevis end with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis.
13. From the rear of the boom, have an assistant push the threaded clevis end of the new retract chain under the chain sheave and down between the second and first boom sections, while pulling the retract chain through the boom using the previously attached string or wire. Keep the retract chain to the right side of the boom, push and pull the threaded clevis down to the tab at the front underside of the boom.



MH2561

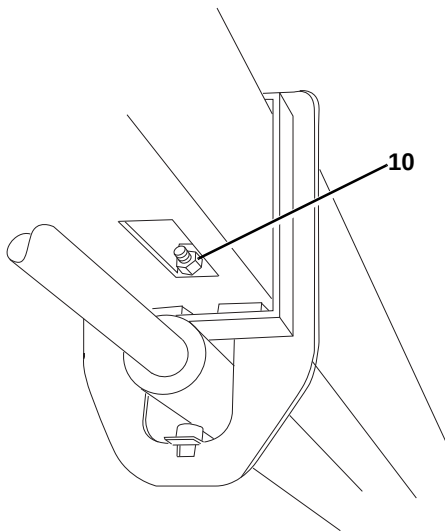
14. Reassemble the flat washer and a locknut (9) onto the threaded clevis. Tighten the locknut until the threaded end of the clevis is flush with the top of the locknut.
15. At the rear of the boom, place the retract chain up and over the chain sheave. Place the clevis between the two anchor plates. Line up the hole in the clevis with the anchor plate hole position recorded during removal.
16. Insert the shoulder bolt through the plates and clevis and secure in place with a locknut. Tighten the locknut securely.
17. Check and adjust the retract chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."



18. Install the boom rear cover.
19. Properly connect the battery.
20. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

d. Fourth Boom Section Retract Chain Removal and Replacement

1. Park the machine on level ground. Place the transmission control lever in (N) NEUTRAL, engage the parking brake switch, level the boom and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the boom rear cover.
5. Start the engine and extend the boom until the retract chain adjustment nut on the bottom of the second boom section is visible. Shut the engine OFF.
6. At the front underside of the boom, locate the retract chain locknut. Record the amount of threads extending beyond the locknut. This measurement will be the starting point for adjustment of the retract chain after installation.

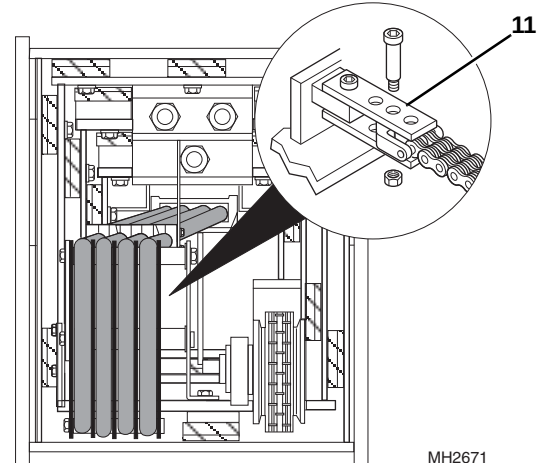


OH0661

7. Loosen the locknut (10) on the retract chain clevis. DO NOT remove the locknut at this time, but loosen the nut as far as possible to gain as much slack as possible in the retract chain.
8. Return to the operator cab, start the engine and slowly retract the boom all the way back, and then extend the boom approximately 1 in (25 mm) or just

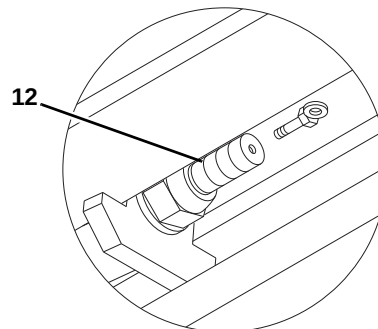
until all the tension on the retract chain is relieved. Shut the engine OFF.

Note: Record the location of the shoulder bolt to ensure correct installation.



MH2671

9. At the rear of the boom, locate the two retract chain anchor plates (11). The two anchor plates can remain in place on the fourth boom section.
10. Pull the retract chain clevis toward the rear of the boom, through the middle of the two center hoses on the chain reel and over the top of the chain reel. Let the clevis end of the retract chain hang out the rear of the boom. Use a piece of wire that is approximately 6 feet (1,8 m) long and tie it to the clevis end of the retract chain. This wire will be used to guide the chain back into the boom when the boom is extended to expose the other end for removal.
11. Have an assistant start the engine and slowly extend the boom. Guide the retract chain with the wire attached into the back of the boom. Extend the boom until the retract chain adjustment nut on the lower left side of the second boom section can be accessed and removed. Turn the engine OFF.
12. Remove the locknut and flat washer holding the threaded clevis on the retract chain to the tab in the second boom section.

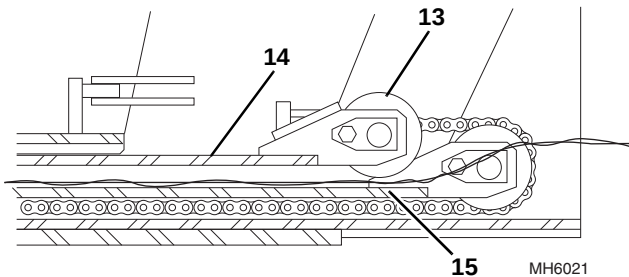


MH6510

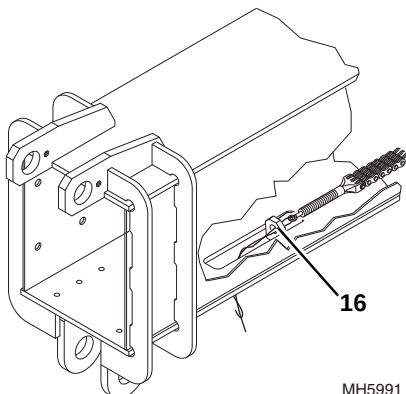


Boom

13. Attach a wire to the end of the retract chain clevis (12) with a threaded eye or a flat washer tack welded to a capscrew. The outside diameter of the eye or flat washer must be smaller than the diameter of the threads on the clevis. The wire must be long enough to pull the clevis and chain through the boom. The wire must be heavy enough to pull the weight of the entire chain back through the boom during the reassembly.
14. From the rear of the boom, using the wire attached to the rear anchor clevis, pull the retract chain through the middle of the two center hoses on the chain reel and over the top of the chain reel and out of the rear of the boom.
15. Remove the wire still attached from the clevis on the old chain.
16. Install the wire still attached, to the new chain clevis.
17. Coat the threads of the threaded clevis on the new chain with multi-purpose grease.



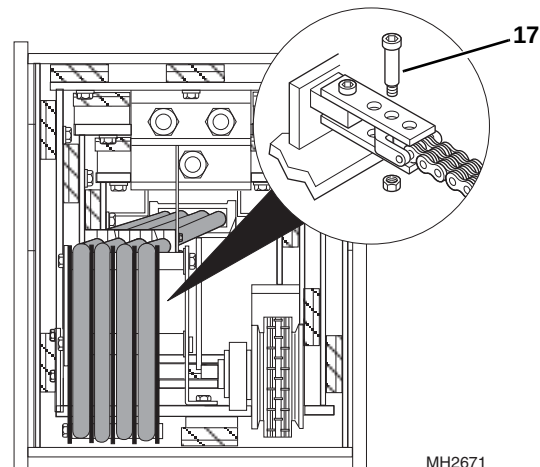
18. From the front of the boom, have an assistant pull on the tow wire while guiding the chain clevis between the two center hoses of the hose reel and under the chain sheave (13), on the left side of the boom and down the boom between the third (14) and second (15) boom sections. Keep the retract chain lined up squarely with the chain sheave and help feed the retract chain in while pulling on the wire from the front of the boom.

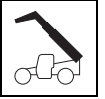


19. Guide the threaded end of the clevis through the hole in the tab (16) on the second boom section.
20. Remove the wire from the end of the clevis.
21. Place the flat washer onto the threaded clevis. Assemble a locknut onto the threaded clevis. Turn the locknut only 2 or 3 turns onto the clevis to allow assembly of the other end of the retract chain.
22. At the front of the boom, disconnect the extend chain clevis from the anchor plates on the second boom section. Remove the locknut holding the shoulder bolt to the anchor plates. Pull the extend chain clevis from between the plates and lay over the front of the fourth boom section.
23. Return to the operator compartment and start the engine and slowly retract the boom. To avoid having the retract chain becoming entangled, keep tension on the chain coming out the back of the boom. Retract the boom as far as possible with the Extend/Retract cylinder. Turn the engine OFF.
24. The fourth boom section will not retract completely and must be manually pushed in. To avoid having the retract chain becoming entangled, keep tension on the chain coming out the back of the boom while the fourth boom section is pushed in.

Note: Care should be taken not to push the fourth boom section in too far. If the fourth boom section is pushed in too far it could damage the hose reel at the back of the boom.

25. Remove the wire from the anchor clevis at the rear of the boom. Place the retract chain up and over the chain sheave in front of the hose reel assembly. Place the clevis between the two anchor plates. Line up the hole in the clevis with the anchor plate hole position recorded during removal.





26. Insert the shoulder bolt (17) through the plates and clevis and secure in place with a locknut. Tighten the locknut securely.
27. Pull the extend chain up and around the sheave at the front of the third boom section.
28. Place the extend chain clevis between the mounting plates at the front of the third boom section. Coat the shoulder bolt with anti-seize compound and insert through the plates and clevis. Secure the shoulder bolt in place with a locknut. Tighten securely, but the chain clevis should pivot freely.
29. Return to the operator compartment and start the engine. Slowly extend the boom to gain access to the retract chain adjustment nut on the lower left side of the second boom section. Shut the engine OFF.
30. Tighten the adjustment nut until the threads of the threaded clevis are flush with the top edge of the nut. This will be a starting point for adjustment of the fourth boom section retract chain.
31. Check and adjust the retract chain tension. Refer to Section 3.7.5, "Boom Chain Tension Check."
32. Install the boom rear cover.
33. Properly connect the battery.
34. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.



Boom

3.8 QUICK ATTACH ASSEMBLY

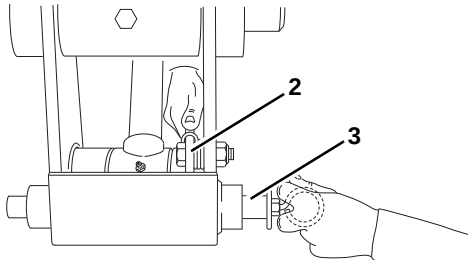
This machine is equipped with a quick attach assembly system for easy attachment changes.

3.8.1 Disconnecting from an Attachment

1. Park the machine on a hard, level surface.
2. Place the transmission control lever in the (N) NEUTRAL position and engage the parking brake switch
3. Extend the boom out approximately 10 ft (3,05 m), ground the attachment and tilt the carriage backward. Shut the engine OFF.
4. Exit the machine using both hand holds.

Note: If removing a standard carriage with forks, spread the forks apart on the carriage shaft. This will help give the carriage better support to stand alone.

5. If equipped, disconnect Auxiliary electric harness.
6. If equipped, disconnect Auxiliary hydraulic hoses.



7. Raise the quick attach pin lock lever (2) and pull out the lock pin (3) at the bottom of the quick attach.
8. Return to the operator cab, fasten the seat belt and lower the attachment to the ground in a level position. Tilt the attachment forward. This will rotate the quick attach link back away from the attachment.
9. Lower and then retract the boom until the attachment pivot pins have disconnected from the attachment.

3.8.2 Connecting to an Attachment

1. Perform this procedure on a hard, level surface only. Position the machine directly behind the attachment to be mounted.
2. Tilt the quick attach backward.
3. Extend the boom approximately 10 ft (3,05 m) and drive the machine forward until the attachment pivot pins are below and between the two hooks on the attachment.

4. Raise the boom until the attachment pivot pins have seated fully in the hooks on the attachment.
5. Tilt the attachment up slightly. The quick attach link should be tight up against the rear of the attachment, and the holes in the link and the attachment should be aligned.
6. Place the travel select lever in the (N) NEUTRAL position, engage the parking brake switch, unbuckle the seat belt and exit the machine using both hand holds.
7. Lift the quick attach lever. Insert the quick attach pin completely through the attachment and the quick attach link. Be sure that the quick attach lock lever has lowered and seated itself into the groove in the quick attach pin.
8. If equipped, connect Auxiliary hydraulic hoses.
9. If equipped, connect Auxiliary electric harness.
10. Return to the cab, fasten the seat belt and resume operation.

3.8.3 Quick Attach Removal

1. Remove the lock bolt holding the Attachment Tilt cylinder rod end pin to the quick attach assembly. Remove the Attachment Tilt Cylinder pin.
2. Support the quick attach assembly. Remove the capscrew and locknut securing the quick attach pivot pin to the quick attach assembly. Remove the quick attach assembly. Record the location and quantity of the shim washers as the pin is being removed.
3. Inspect the above pins for nicks or surface corrosion. Use fine emery cloth to fix minor nicks or corrosion. If damaged or if it cannot be repaired the pin must be replaced.

3.8.4 Quick Attach Installation

1. Assemble the quick attach to the boom head. Line up the quick attach between the mounts on the boom head. The quick attach should be centered in the boom head. Reassemble the shims between the quick attach and the boom head.
2. Coat the quick attach head pin with an anti-seize compound. Insert the quick attach head pin through the quick attach and boom head. Secure with the previous capscrew and locknut.
3. Align the quick attach with the Attachment Tilt cylinder rod end and insert the Attachment Tilt cylinder pin. Align the Attachment Tilt cylinder pin and screw in the locking bolt. Torque as required.

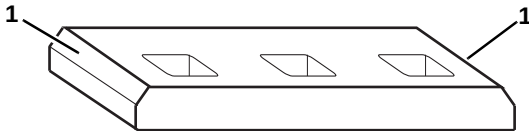


3.9 BOOM WEAR PADS

The wear pads on this machine are flat rectangular wear pads with metal inserts.

A total of 32 wear pads are installed on the boom sections of the 6036, 6024, 8042 & 10042 machines and 47 wear pads on the 10054 machines.

3.9.1 Wear Pad Inspection



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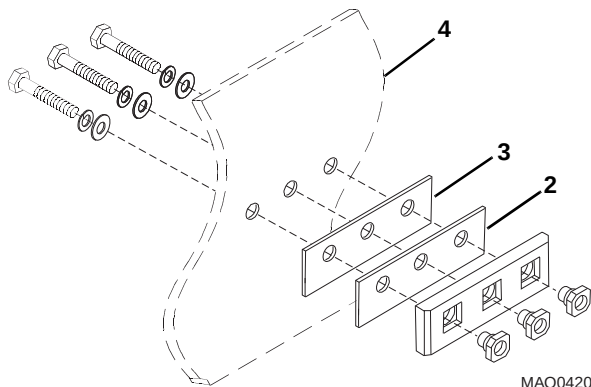
Inspect all wear pads for wear. If the angle indicators (1) on the ends of the wear pads are visible, the wear pads can be reused. If the pads show uneven wear (front to back), they should be replaced. Replace pads as a set if worn or damaged.

3.9.2 Wear Pad Installation and Lubrication

Note: Inspect all wear pads. Replace as necessary.

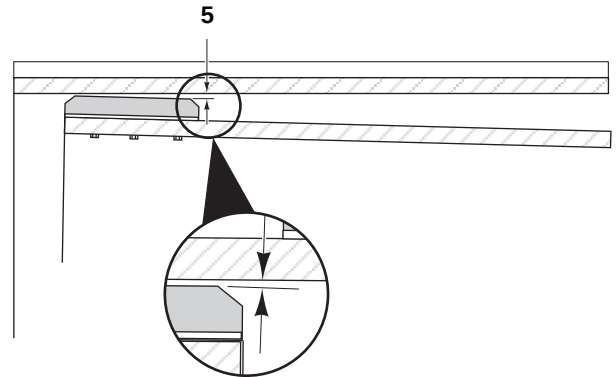
The following wear pad procedure must be followed to insure the proper wear pad installation:

- The wear pad inserts and mounting bolts MUST be clean from any grease, oil or other contaminants before applying Loctite® 242™ and installing mounting bolts.
- Apply Loctite® 242™ to all wear pad mounting bolts.

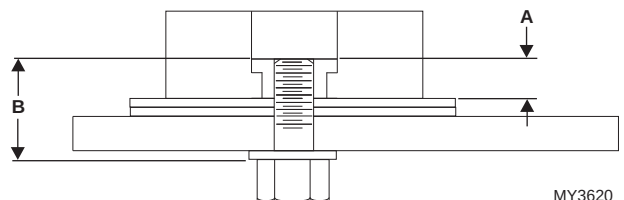


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- A spacer (2) must be used before any shim (3) is used.
- A shim (3) must be inserted between the spacer (2) and wear pad support plate, block or boom section (4).
- The number of shims can vary at each shim point.
- The bottom wear pads must be shimmed equally on each side.



- Maintain a total boom section clearance (5) of 0.070 - 0.130 in (1,78 - 3,30 mm) both the horizontal and vertical directions.



MY3620

- The length of the wear pad bolt depends on the number of shims, spacers and washers being used.
- The thickness of each threaded wear pad insert is 0.562 in (14,27 mm)(A).
- The bolt length should be determined by measuring the distance from the face of the insert to the face of the boom (B) including any spacer, shim(s) and washer(s).
- Bolt thread engagement in the wear pad insert should be 0.235 - 0.315 in (5,98 - 8,0 mm).
- One or two hardened washers are to be used on each wear pad bolt except where noted otherwise. DO NOT use more than two hardened washers.
- Use only one hardened washer if mounting bolts are recessed.
- Wear Pad Bolt Torque: 3/8-16 Bolt, 31 lb-ft (42 Nm)
- Torque wear pad bolts after shimming is completed.
- Lubricate the face and pockets of each wear pad after being installed.

Boom Section Wear Pad Pathway Lubrication:

- Clean and lightly grease all wear pad pathways with Mystik Tetrimoly grease.
- Clean and lightly grease the hose carrier guide bar pathways with Mystik Tetrimoly grease.



Boom

3.10 BOOM EXTEND AND RETRACT CHAINS

3.10.1 Boom Chain Inspection



WARNING

Worn pins, stretched or cracked links or corrosive environments can cause chain failure. A chain failure could result in uncontrolled boom movement, loss of load or machine instability.

Under normal operating conditions the boom chains will need to be inspected every 250 hours of operation. The retract chains need to be exposed and inspected every 1000 hours of operation. Environmental conditions and dynamic impulse/shock loads can drastically affect normal operating conditions and require more frequent inspection intervals.

Environments in which material handling vehicles operate can vary widely from outdoor moisture to temperature to mildly corrosive or highly corrosive industrial atmospheres, in addition to abrasive exposures such as sand and grit. Some effects can be as follows:

- Moisture - Corrosive rusting reduces chain strength by pitting and cracking.
- Temperature - Low temperature reduces chain strength by embrittlement. Going in and out of cold storage results in moisture from condensation.
- Chemical Solutions or Vapors - Corrosive attack on the chain components and/or the mechanical connections between the chain components. Cracking can be (and often is) microscopic. Going from microscopic cracking to complete failure can be either abrupt or may require an extended period of time.
- Abrasives - Accelerated wearing and scoring of the articulating members of the chain (pins and plates), with a corresponding reduction in chain strength. Due to the inaccessibility of the bearing surfaces (pin surfaces and plate apertures), wear and scoring are not readily noticeable to the naked eye.

Following are some examples of dynamic shock loading which can impose abnormal loads above the endurance limit of a leaf chain.

- High velocity movement of load, followed by sudden, abrupt stops.
- Carrying loads in suspension over irregular surfaces such as railroad tracks, potholes, and rough terrain.
- Attempting to "inch" loads which are beyond the rated capacity of the vehicle.

The above load cycles and environmental conditions make it impossible to predict chain life. It is therefore necessary to conduct frequent inspections until replacement life can be predicted.

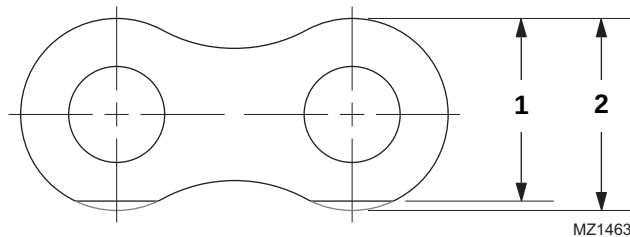
The boom chain's normal life expectancy can be expressed as a maximum percent of elongation. This is generally 3%. As the chain flexes back and forth over the sheave, the bearing joints (pins and inside link plates) gradually incur wear due to articulation.

3.10.2 Inspection Guidelines

1. Park the machine on a firm, level surface, raise the boom to a horizontal (level) position, place the transmission control lever in (N) NEUTRAL, engage the park brake switch.
2. Fully extend the boom until the extend chain is taut. Shut the engine off.
3. The extend chains will be visible for inspection with the vehicle in this state.
4. While doing the chain inspection, check all chain clevis ends for distortion or cracking and sheaves for bearing wear or grooving from the chain.
5. Inspect the retract chains every 1000 hours of operation.
6. Inspect the chains for the following conditions:



Edge Wear

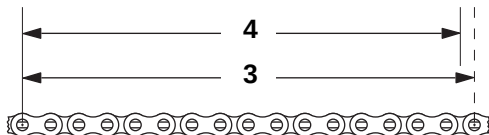


Check the chain for wear on the link plate edges caused by running back and forth over the sheave. The maximum reduction of material should not exceed 5%. Measure and compare to a normal link plate height by measuring a portion of chain that does not run over the sheave. If the measured plate height (1) is 5% less than the normal plate height (2), discard and replace the chain.

Elongation

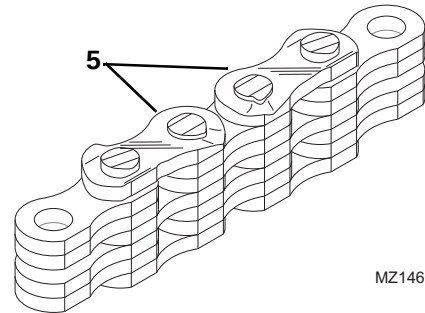
It is important to measure the chain in the section that moves over the sheaves because it receives the most frequent articulation. Measuring the chain near its clevis terminals could give an inaccurate reading. The ends of the chains, near the clevis terminal, will not have flexed as frequently, if at all, as the middle of the chains.

It is best to measure in 12 pin increments from pin center to pin center. For example, if the links are one inch from pin center to pin center, the distance should be 12 in (305 mm). If the links are 3/4 in (19,0 mm) apart, the distance after 12 pins should be 9 in (228,6 mm).



If the distance measured (3) is 3% greater than the normal length (4), discard and replace the chain.

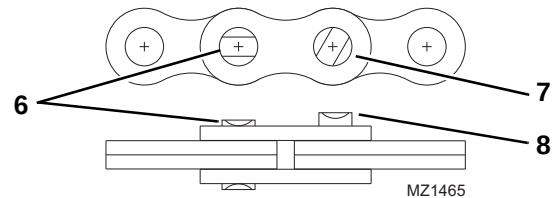
Distorted or Battered Link Plates



Distorted or battered link plates (5) on a leaf chain can cause tight joints and prevent flexing.

Turning or Protruding Pins

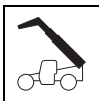
Highly loaded chain, operating with inadequate lubrication can generate abnormal frictional forces between pin and link plates. When chain is allowed to operate in this condition, a pin or series of pins, can begin to twist out of a chain, resulting in failure.



Examine the pin head rivets to determine if the "VEE" flats are still in correct alignment (6). Chain with rotated/displaced heads (7) or abnormal pin protrusion (8) should be replaced immediately.

DO NOT attempt to repair the chain by welding or driving the pin(s) back into the chain. Once the press fit integrity between outside plates and pins has been altered, it cannot be restored.

Any wear pattern on the pin heads or the sides of the link plates indicates misalignment in the system. This condition damages the chain as well as increases frictional loading and should be corrected.



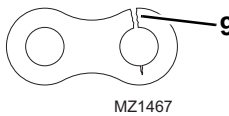
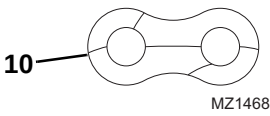
Boom

Cracked Plates

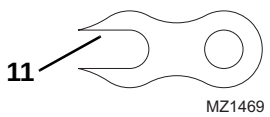
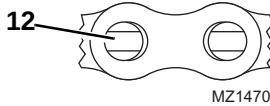
Inspect the chains very carefully, front and back as well as side to side, for any evidence of cracked plates. If any one crack is discovered, the chain should be replaced in its entirety.

It is important, however to determine the cause of the crack before installing a new chain so the condition does not repeat itself.

The types of cracks are:

- **Fatigue Cracking** - Fatigue cracks (9) are a result of repeated cyclic loading beyond the chain's endurance limit.  MZ1467
- **Stress Corrosion Cracking** - The outside link plates are particularly susceptible to stress corrosion cracking (10).  MZ1468
- **Corrosion Fatigue Cracking** - Corrosion fatigue cracks are very similar to fatigue cracks in appearance. Corrosion fatigue is the combined action of an aggressive environment and cyclic stress.

Other Modes of Failure

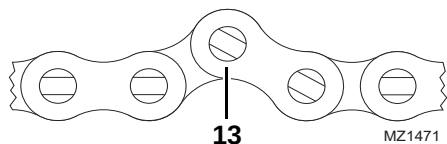
- **Ultimate Strength Failure** - These types of failures are caused by overloads far in excess of the design load. Either fractured plates (11) or enlarged holes (12) can occur. If either of these failures occurs, the chain should be replaced immediately.  MZ1469
-  MZ1470

- **Tight Joints**

- All joints in the chain should flex freely. Tight joints (13) resist flexing.

If the problem is caused by dirt or foreign substance packed in the joints, clean and lubricate thoroughly before re-installing the chain.

If the problem is caused by corrosion and rust or bent pins, replace the chain.



3.10.3 Expose Chains for Inspection

e. Extend Chains

1. Park the machine on a firm, level surface. Place the transmission control lever in (N) NEUTRAL, engage the park brake switch and raise the boom to a horizontal (level) position.
2. Fully extend the boom until both extend chains are taut. Shut the engine OFF.

The extend chains will be visible for inspection with the machine in this state.

While doing the chain inspection, check all chain clevis ends for distortion or cracking and sheaves for bearing wear or grooving from the chain.

If during the inspection, any chain is found to be damaged or stretched, the chain must be replaced. It is recommended that when any chain is replaced, that all the chains and clevises be replaced at the same time.

f. Retract Chains

The three retract chains are only partially visible through the rear of the boom with all the sections retracted. It is possible to see a section of the retract chain as the boom is slowly extended. If there is ANY question that one or all the retract chains are damaged, the boom should be removed and disassembled with the retract chains being inspected and replaced if necessary.

Note: ***DO NOT** attempt to repair a chain. Replace a stretched or damaged chain with a new part. Always replace both the chain and the clevis. It is recommended that when any chain is replaced, that all chains and clevises be replaced at the same time.*



3.10.4 Chain Lubrication

After inspection and before being returned to service, chains must be lubricated with Mystik Tetrimoly Grease.

The lubricant must penetrate the chain joint to prevent wear. Applying lubricant to the external surfaces will prevent rust, but the chains should be articulated to make sure the lubricant penetrates to the working surfaces between the pins and links.

To prepare the chain for lubrication, the chain plates should be brushed with a stiff brush or wire brush to clear the space between the plates so that lubricant can penetrate to the working surfaces.

Lubricant may be applied with a narrow paint brush or directly poured on, but the chain should be well flooded with lubricant and the boom should be extended and retracted to be sure that the lubricant penetrates to the working surfaces. All surplus lubricant should be wiped away from the external surfaces. **DO NOT** use a solvent for this wiping operation.

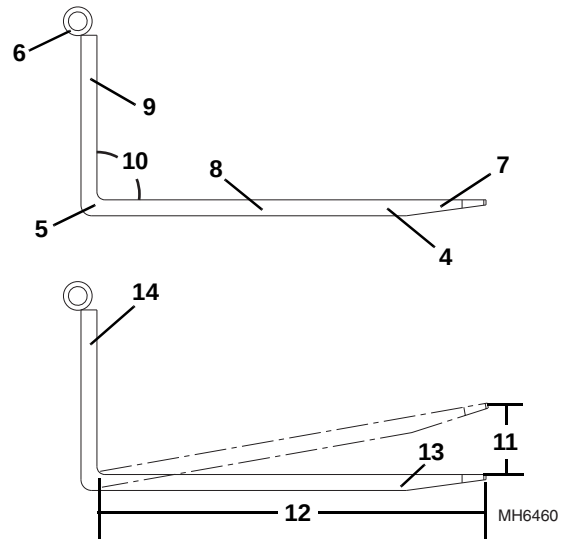
Regular application of lubricant is necessary to make sure that all working surfaces are adequately lubricated. In extremely dusty conditions, it may be necessary to lubricate the chains more often. Refer to Section 2.5, "Service and Maintenance Schedules," and Section 2.6, "Lubrication Schedules," for detailed information.

Lubrication of chains on vehicles working consistently in extreme hot or cold conditions requires special consideration. Contact the local distributor for guidance.

3.11 FORKS

Forks should be cleaned and inspected prior to being attached to carriage. If the following criteria is not met, forks must be removed from service immediately.

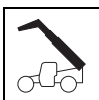
Daily Inspection



1. Inspect forks (4) for cracks, paying special attention to heel (5) and mounting tubes (6).
2. Inspect forks for broken or bent tips (7) and twisted blades (8) and shanks (9).

Yearly Inspection

1. Straightness of the upper face of blade (8) and the front face of shank (9) should not exceed 0.5 percent of the length of blade or height of shank.
2. Angle (10) between upper face of blade and front face of shank should not exceed 93 degrees.
3. Thickness of blade (13) and shank (14) should not be reduced to 90 percent of original thickness.
4. Ensure fork length (12) is adequate for intended loads.
5. Fork markings should be legible, re-stamp if required.
6. Compare fork tips (11) when mounted on a carriage. Maximum difference in height of fork tips is 3 percent of the length of the blade (13).

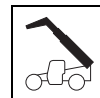


Boom

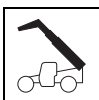
3.12 TROUBLESHOOTING

This section provides an easy reference guide covering the most common problems that occur during operation of the boom.

Problem	Cause	Remedy
1. Boom will not extend or retract	1. Broken hydraulic hose(s) or tube(s) and/or connections leaking. 2. Extend/retract hydraulic system not operating properly. 3. Faulty extend/retract cylinder. 4. Broken chains or anchors	1. Locate break, replace hose(s) or tube(s), tighten connections. 2. Refer to Section 8.4, "Hydraulic Circuits." 3. Repair cylinder. Refer to Section 8.8.1, "General Cylinder Instructions." 4. Replace chains as needed
2. Boom shifts to right or left when extending.	1. Boom side wear pads improperly shimmed or worn.	1. Shim wear pads to correct gap. Replace wear pads as needed. Refer to Section 3.9, "Boom Wear Pads."
3. Excessive pivot pin noise and/or wear.	1. Insufficient lubrication. 2. Worn bearing(s).	1. Lubricate at regular intervals. Refer to Section 2.6, "Lubrication Schedules." Replace worn pins as needed. 2. Replace bearing(s) and lubricate at regular intervals. Refer to Section 2.6, "Lubrication Schedules."
4. Excessive Compensation cylinder pivot pin noise and/or wear.	1. Insufficient lubrication. 2. Worn bushing(s).	1. Lubricate at regular intervals. Refer to Section 2.6, "Lubrication Schedules." Replace worn pins as needed. 2. Replace bushing(s) and lubricate at regular intervals.
5. Boom will not raise or lower.	1. Broken hydraulic hoses or tubes and/or connection leaks. 2. Lift/lower hydraulic system not operating properly. 3. Faulty lift/lower cylinder. 4. Seized boom pivot pin bearing.	1. Locate break, replace hose(s) or tube(s), tighten connections. 2. Refer to Section 8, "Hydraulic System." 3. Repair cylinder. Refer to Section 8.8, "Hydraulic Cylinders." 4. Replace bearing.

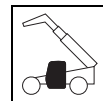


Problem	Cause	Remedy
6. Drooping chain, or jerky boom extend or retract functions.	1. Chain(s) tension not properly adjusted. 2. Chain(s) stretched or binding. 3. Wear pads loose, contaminated, excessively worn or damaged. 4. Contaminated, corroded or rusted wear pad sliding surfaces. 5. Extend/Retract hydraulic system not operating properly. 6. Damaged boom section.	1. Adjust chain(s). 2. Replace chains as needed. Refer to Section 3.7, "Boom Extend and Retract Chains." 3. Replace wear pad. Refer to Section 3.9, "Boom Wear Pads." 4. Remove contamination and/or corrosion from wear pad sliding surfaces and lubricate. If the surfaces cannot be reconditioned, replace the boom section(s). 5. Refer to Section 8.4, "Hydraulic Circuits." 6. Replace the damaged boom section. Refer to Section 3.4, "Boom Assembly Maintenance."
7. Boom will not raise or lower.	1. Broken hydraulic hoses or tubes and/or connection leaks. 2. Lift/Lower hydraulic system not operating properly. 3. Faulty Lift cylinder. 4. Seized boom pivot pin bushing.	1. Locate break, replace hose(s) or tube(s), tighten connections. 2. Refer to Section 8.4, "Hydraulic Circuits." 3. Repair cylinder. Refer to Section 8.8.1, "General Cylinder Instructions." 4. Replace bushing.
8. Excessive Lift/Lower cylinder pivot pin noise and/or wear.	1. Insufficient lubrication. 2. Worn self-aligning bushing(s).	1. Lubricate at regular intervals. Refer to Section 2.5, "Service and Maintenance Schedules." Replace worn pins as needed. Refer to Section 8.8.1, "General Cylinder Instructions." 2. Replace bushing(s) and lubricate at regular intervals. Refer to Section 2.6, "Lubrication Schedules."



Boom

Problem	Cause	Remedy
9. Rapid boom pad wear.	1. Incorrect wear pad gap. 2. Rapid cycle times with heavy loads. 3. Contaminated, corroded or rusted wear pad sliding surfaces. 4. Operating in extremely dusty/abrasive conditions.	1. Check wear pad gaps and correct as needed. Refer to Section 3.9, "Boom Wear Pads." 2. Reduce cycle times. 3. Remove contamination and/or corrosion from wear pad sliding surfaces and lubricate. If the surfaces cannot be reconditioned, replace the boom section(s). 4. Clean equipment frequently.
10. Auxiliary hydraulics will not operate.	1. Auxiliary hydraulic system not operating properly.	1. Refer to Section 8, "Hydraulic System."
11. Excessive chain wear.	1. Improper chain adjustment. 2. Chain sheave(s) not properly lubricated. 3. Chain sheave(s) not rotating freely. 4. Improper chain lubrication.	1. Adjust to correct tension. Refer to Section 3.7.1, "Boom Chain Inspection."- Replace chains as needed. 2. Lubricate chain sheave. (Refer to Section 2.5, "Service and Maintenance Schedules.") 3. Lubricate chain sheave. Refer to Section 2.5, "Service and Maintenance Schedules." Repair or replace chain sheave(s) as needed. 4. Lubricate at regular intervals. Refer to Section 2.5, "Service and Maintenance Schedules." Replace chains as needed.

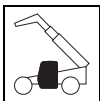


Section 4

Cab and Covers

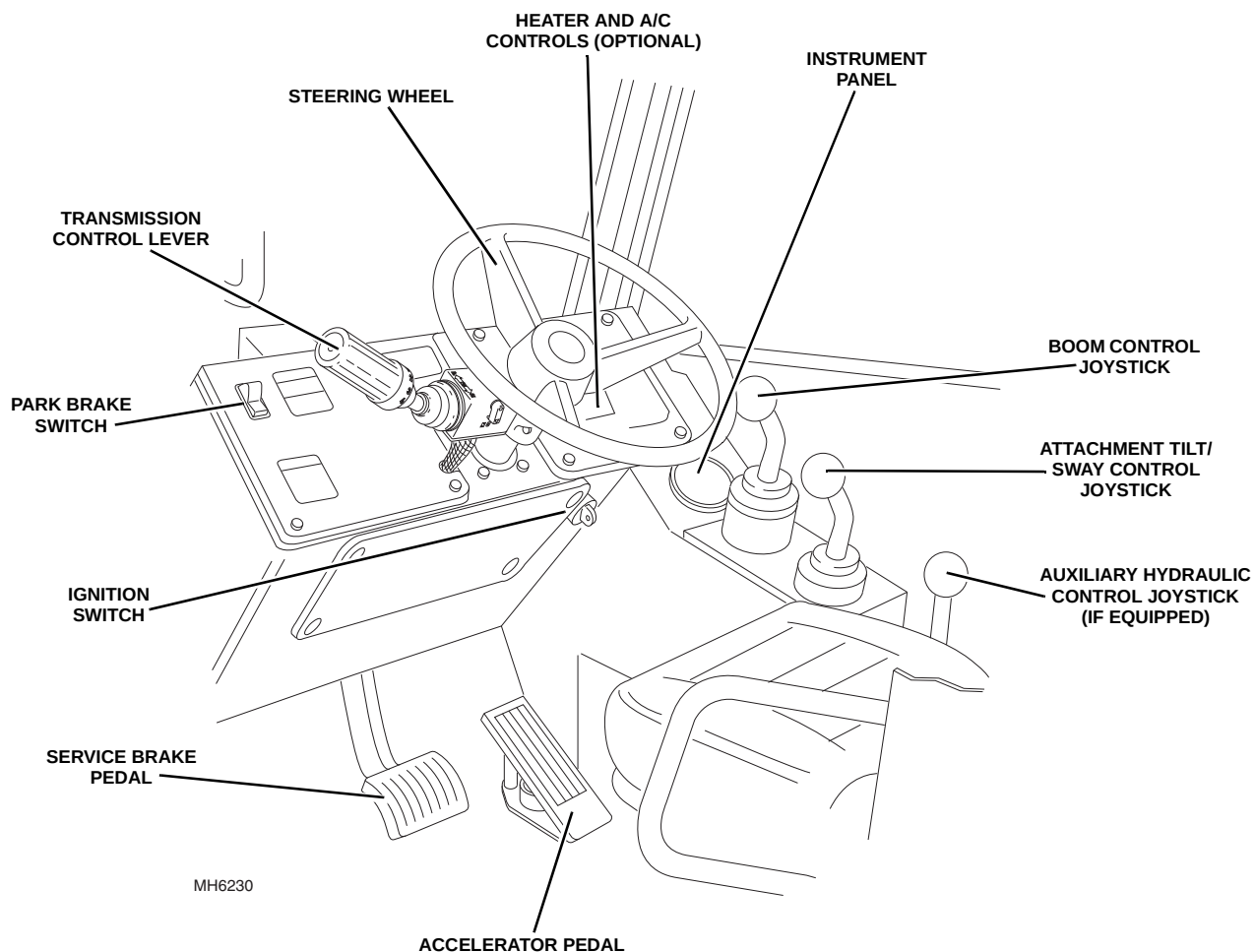
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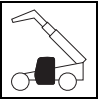
PARAGRAPH	TITLE	PAGE
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4.2	Operator Cab	4-3
4.2.1	Cab Safety	4-3
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4.1 OPERATOR CAB AND COVERS COMPONENT TERMINOLOGY

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the machine cab and covers. The following illustration identifies the components that are referred to throughout this section.





WARNING

DO NOT service the machine without following all safety precautions as outlined in the “Safety Practices” section of this manual.

4.2 OPERATOR CAB

4.2.1 Cab Safety



WARNING

The protection offered by this ROPS/FOPS will be impaired if subjected to any modification or structural damage, at which time replacement is necessary. ROPS/FOPS must be properly installed using fasteners of correct size and grade, and torqued to their specified value.



WARNING

DO NOT weld, grind, drill, repair or modify the cab in any way. Any modification or damage to cab structural components requires cab replacement. Refer to Section 2.5 in the Operation & Safety Manual.

To help ensure optimum safety, protection and performance, replace the cab if it is damaged. Refer to the appropriate parts manual for ordering information.

4.2.2 Serial Number Decal

The cab serial number decal is located on the left side of the cab, behind the seat. Information specified on the serial number plate includes the cab model number, the cab serial number and other data. Write this information down in a convenient location to use in cab correspondence.

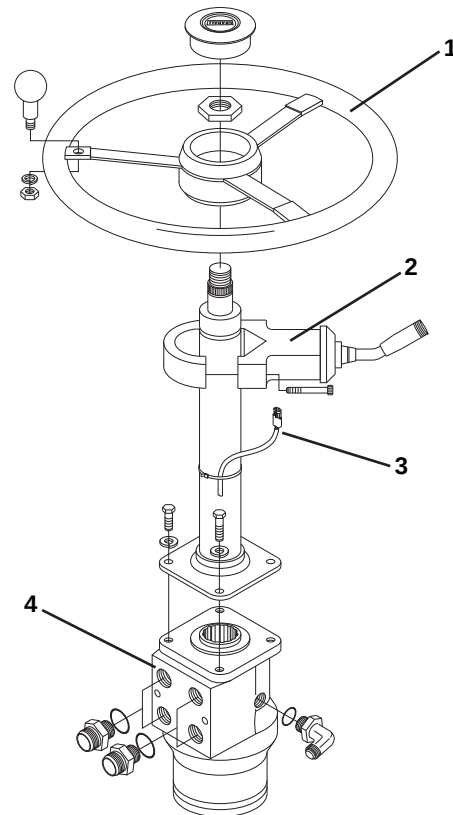
4.3 CAB COMPONENTS

4.3.1 Steering Column and Steering Valve

a. Steering Valve Removal

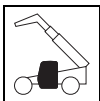
1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake and turn the engine OFF.

2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the left, right and lower dash panels.

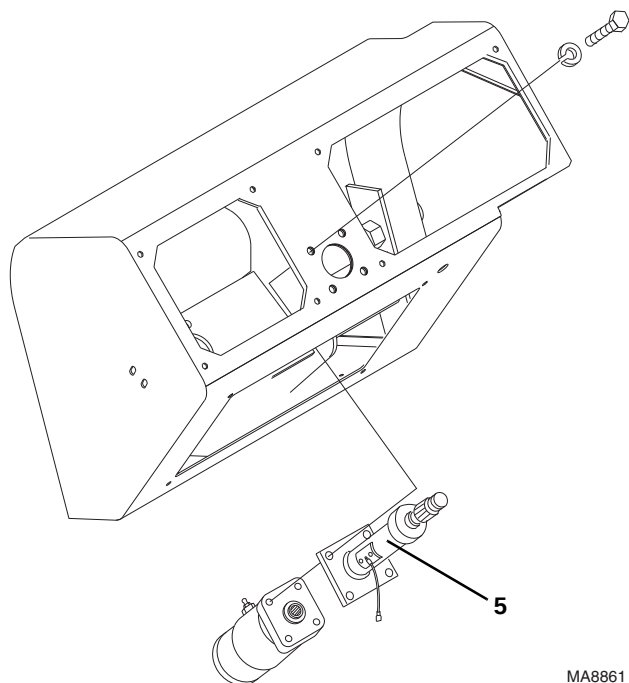


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6. Remove the steering wheel (1), disconnect and remove the travel select lever (2), disconnect the instrument panel harness connector (3).
7. Label, disconnect and cap the four hoses from the side of the steering valve (4). Cap the fittings on the steering valve. Label, disconnect and plug the load sense hose at the front of the steering valve. Cap the fitting on the steering valve.
8. Disconnect the horn button wire from the cab wiring harness.
9. Support the bottom of the steering valve, and remove the four capscrews and lockwashers. Remove the steering valve through the lower dash panel opening.



Cab and Covers



10. Remove the steering column (5), by pushing it down, and removing it through the lower dash panel opening.

Note: DO NOT disassemble the steering valve. The steering valve is not serviceable and must be replaced in its entirety, if defective.

b. Steering Valve Installation

1. Install the steering column and steering valve, by inserting them through the lower dash panel opening. Position steering valve in the cab to its original orientation. Secure the steering valve and column with the previously used hardware. Torque to 13 lb-ft (18 Nm).

Note: ALWAYS use new o-rings when servicing the machine.

2. Install new o-rings into the fittings. Lubricate the o-rings with clean hydraulic oil.
3. Uncap and connect the previously labeled load sense hose to the steering valve.
4. Install new o-rings into the steering valve fittings. Lubricate the o-rings with clean hydraulic oil.
5. Uncap and connect the remaining previously labeled four hoses to the steering valve.
6. Connect the horn button wire to the cab wiring harness.

7. Install the travel select lever, connect the instrument panel harness connector, install the steering wheel assembly. Torque the steering wheel nut to 50 lb-ft (68 Nm).
8. Properly connect the battery.
9. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
10. Start the engine and check the operation of steering system. Check for hydraulic fluid leaks. Check the hydraulic fluid level in the tank and add fluid as required.
11. Install the left, right and lower dash panels.
12. Close and secure the rear door.

c. Steering Test

Conduct a pressure check of the steering hydraulic circuits at the main control valve. Refer to Section 8.3.1, "Pressure Checks and Adjustments."

4.3.2 Service Brake Pedal

a. Brake Valve Removal

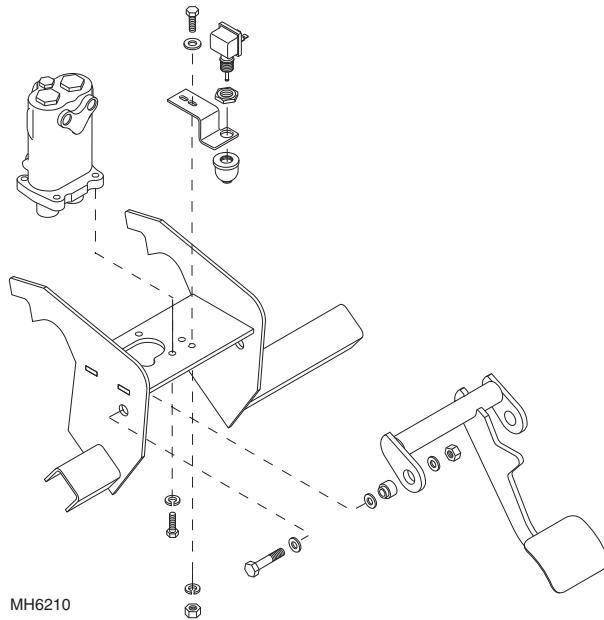
Refer to Section 8.7.3, "Service Brake Valve," for removal information.

b. Brake Valve Installation

Refer to Section 8.7.3, "Service Brake Valve," for installation information.

c. Service Brake Pedal Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake and turn the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. Remove the lower dash panel.
6. Remove the two capscrews, four flat washers, two pivots and two nuts securing the service brake pedal to the cab.
7. Remove the service brake pedal from the cab.

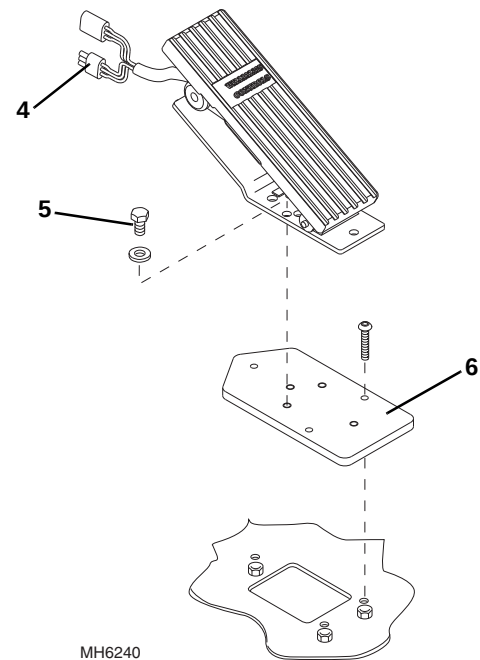
d. Service Brake Pedal Installation

1. Position the service brake pedal in its mounting location within the cab.
2. Insert the two brake pedal pivots into mounting locations on the service brake pedal.
3. Install the service brake pedal with the previously used hardware.
4. Be sure the brake pedal has the correct range of motion. Secure pivot pin with bolt and lockwasher.
5. Adjust the service brake as needed. Refer to Section 9.10.5, c. "Service Brake Switch Adjustment."
6. Install the lower dash panel.
7. Properly connect the battery.
8. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
9. Close and secure the rear door.

4.3.3 Throttle Pedal

a. Throttle Pedal Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake and turn the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.



4. Disconnect the electrical harness connector (4).
5. Remove the bolts (5) securing the throttle pedal to the throttle pedal bracket (6).
6. Remove the throttle pedal assembly from the cab.

b. Throttle Pedal Installation

1. Position the throttle pedal in its mounting location within the cab.
2. Secure the throttle pedal in place with previously used hardware.
3. Reconnect the wire harness plug to the front of the throttle pedal.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

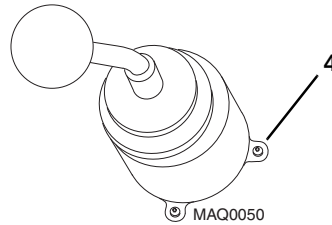


4.3.4 Joystick Assemblies

These removal and installation instructions apply to the boom control, attachment tilt/sway and auxiliary hydraulic joysticks.

a. Joystick Assembly Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake and turn the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Remove the console panel in the cab.



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6. Remove the four cap screws (4) and remove the joystick assembly from the machine.

b. Joystick Assembly Installation

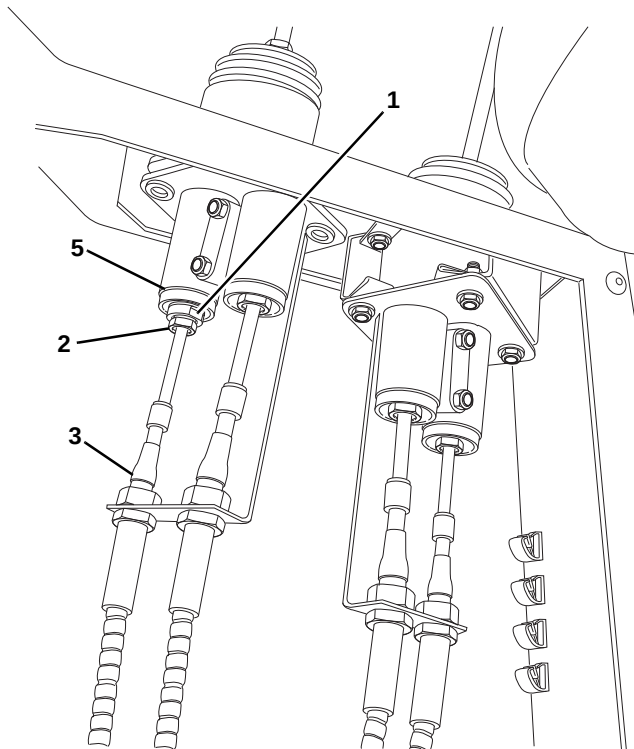
1. Secure the joystick to the cab with the previously used hardware.
2. Connect the control cables at the joystick:
 - a. Install the end of the control cable into the slider head (5) as recorded during removal. Tighten the upper jam nut (3).
 - b. Loosely install the cable nut (2) into the slider head.
 - c. Engage the control lever to expose the flats (1) on the slider head. Place a wrench on the flats to hold the slider head, and tighten the cable nut to a maximum of 55 lb-ft (75 Nm).
 - d. Repeat steps for remaining cables.
3. Properly connect the battery.
4. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
5. Test the joystick function:

Boom Control Joystick:

- Move the joystick handle rearward, activating the boom lift function. The boom should RISE.
- Move the joystick handle forward, activating the boom lower function. The boom should LOWER.
- Move the joystick handle to the right, activating the boom extend function. The boom should EXTEND.
- Move the joystick handle to the left, activating the boom retract function. The boom should RETRACT.

Attachment Tilt/Sway Control Joystick

- Move the joystick handle rearward, activating the attachment tilt function. The boom should TILT UP.
- Move the joystick handle forward, activating the attachment tilt function. The boom should TILT DOWN.
- Move the joystick handle to the right, activating the frame sway function. The boom should SWAY RIGHT.



MA8521

Note: Record the location, and label all cables to ensure correct installation.

5. Disconnect control cables at the joystick:
 - a. Push the control lever to expose the flats (1) on the slider head. Place a wrench on the flats to hold the slider head, and loosen the cable nut (2).
 - b. Loosen the upper jam nut (3), and remove the cable from the bracket.
 - c. Repeat steps for remaining control cables.



- Move the joystick handle to the left, activating the frame sway function. The boom should SWAY LEFT.

Auxiliary Control Joystick

- Move the joystick handle to the right, the auxiliary attachment should LOWER/OPEN.
 - Move the joystick handle to the left, the auxiliary attachment should RAISE/CLOSE.
6. Install console panel in the cab.
 7. Install the transmission covers.

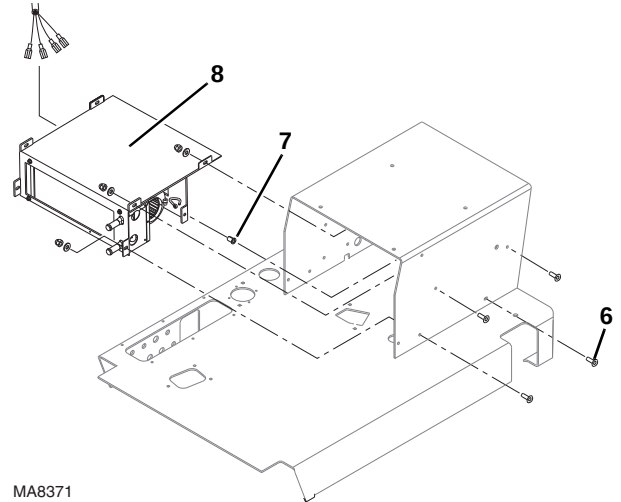
4.3.5 Windshield Wiper Assembly

Refer to Section 9.8, "Window Wiper/Washer Windshield Wiper Motor," for removal and installation information.

4.3.6 Heater/Defroster System (If Equipped)

a. Heater Assembly Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Place a suitable container beneath the radiator drain plug or petcock. Slowly turn the radiator cap to the first stop, and allow any pressure to escape. Remove the radiator cap.
6. Place a funnel at the base of the radiator to channel the drained coolant into the container. Loosen the drain plug or petcock and allow the coolant to drain.
7. Transfer the coolant to a container with a cover, and label as "Used Antifreeze." Dispose of the used coolant at an approved recycling facility.
8. Close the radiator drain plug or petcock.
9. Remove the heater access panel.
10. Label, disconnect and cap the heater hoses. Pull the hoses through the grommets.



MA8371

Note: The capscrew (6) at the lower rear position on each side of the heater will be secured with an insert nut (7).

11. Remove the eight capscrews, six nuts and six lockwashers.
12. Carefully pull the heater assembly forward. Label and disconnect the wiring harness connections at the blower.
13. Remove the heater assembly (8).
14. **If the heater assembly is to be replaced:** Remove the four hex-slotted capscrews, and remove the mounting bracket from the heater assembly.

b. Heater Assembly Installation

1. Connect the wiring harness connections to the blower.

Note: The capscrew (6) at the lower rear position on each side of the heater will be secured with an insert nut (7).

2. Slide the heater/mounting bracket assembly (8) into the seat riser, and secure with the eight capscrews, six lockwashers and six nuts.
3. Pull the hoses through the grommets. Uncap and connect the previously labeled hoses to the heater.
4. Install the heater access panel and secure with the previously used hardware.
5. Fill the cooling system completely with coolant, allowing time for the coolant to fill the engine block. The cooling system capacity is listed in Section 2.4, "Fluid and Lubricant Capacities."
6. Properly connect the battery.



Cab and Covers

7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

Note: When the engine is initially started, run it briefly at low idle and check the machine for any visual sign of fluid leakage. STOP the engine immediately if any leakage is noted, and make any necessary repairs before continuing.

8. Wait for the engine to cool and check the coolant level. Add coolant as required to bring the coolant to the proper level.

4.4 CAB REMOVAL

WARNING

The protection offered by this ROPS/FOPS will be impaired if subjected to any modification or structural damage, at which time replacement is necessary. ROPS/FOPS must be properly installed using fasteners of correct size and grade, and torqued to their specified value.

Note: To help ensure safety and optimum performance, replace the cab if it is damaged. Refer to the appropriate parts manual for ordering information.

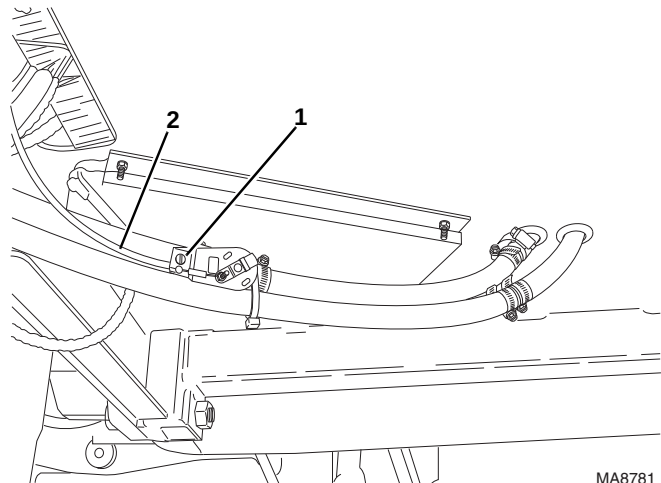
Inspect the cab, its welds and mounts. If modification, damage, a cracked weld and/or fatigued metal is discovered, replace the cab. Contact the local distributor with any questions about the suitability or condition of a cab.

Note: Remove and label cab components as needed before removing the cab from the machine. Label, disconnect and cap hydraulic hoses. Transfer cab parts to the replacement cab after the replacement cab is securely mounted on the machine.

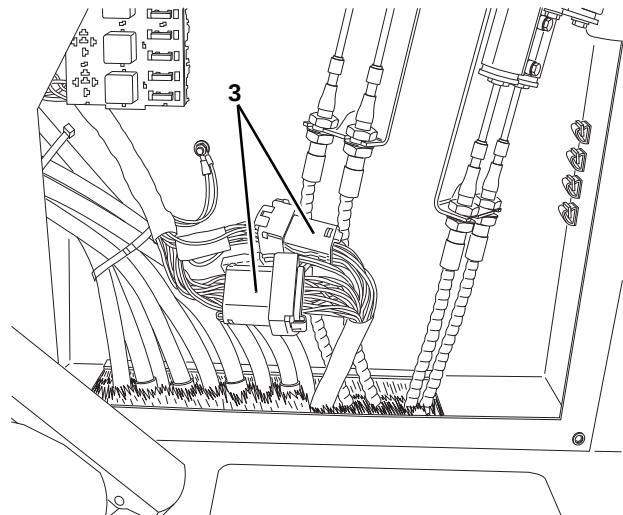
1. Park the machine on a firm, level surface. Allow sufficient overhead and side clearance for cab removal. Level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the park brake and shut the engine OFF.
2. Block all four wheels to help prevent the machine from moving. Assure that there is sufficient overhead and side clearance for cab removal.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.

Note: Steps 5 thru 10 apply to machines equipped with cab heater.

5. Place a suitable container beneath the radiator drain plug or petcock. Slowly turn the radiator cap to the first stop and allow any pressure to escape. Remove the radiator cap.
6. Place a funnel at the base of the radiator to channel the drained coolant into the container. Loosen the drain plug or petcock and allow the coolant to drain.
7. Transfer the coolant to a container with a cover, and label as "Used Antifreeze." Dispose of the used coolant at an approved recycling facility.
8. Close the radiator drain plug or petcock.

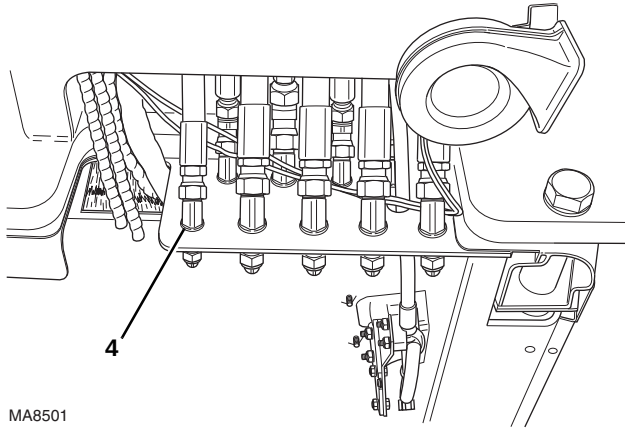


9. Working under the cab, loosen the clamp screw (1) and disconnect the heater control cable (2) from the heater control valve. Label, disconnect and cap the heater hoses.
10. Remove the heater access panel. Label, disconnect and cap the heater hoses and route them through the opening in the bottom of the cab.
11. Remove the console panel in the cab.



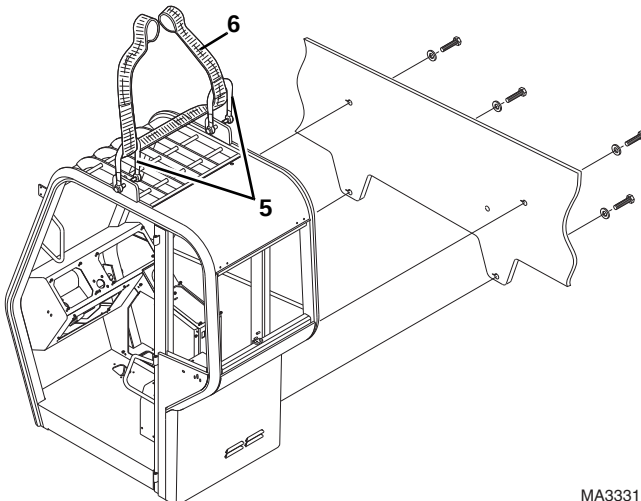


12. Label and disconnect the two cab-to-wiring harness connectors (3). Push the connectors through the opening at the bottom of the cab.
13. Remove the joystick assemblies from the cab. Refer to Section 4.3.4, a. "Joystick Assembly Removal." Route the joystick cables through the opening at the bottom of the cab.



MA8501

14. Working under the cab, label, disconnect and cap the hydraulic hoses at the cab fittings (4). Cap all fittings to keep dirt and debris from entering the hydraulic system.
15. If necessary, remove mirrors and other cab components that may become damaged during cab removal.



MA3331

16. Attach a clevis (5) to each of the cab lifting brackets. Route a sling (16) with a minimum lifting capacity of 1000 lb (453 kg) to a hoist or overhead crane. Center the sling to ensure even lifting.
17. Remove the two upper cab-to-frame capscrews and two flat washers.
18. Remove the two lower cab-to-frame capscrews and two flat washers.

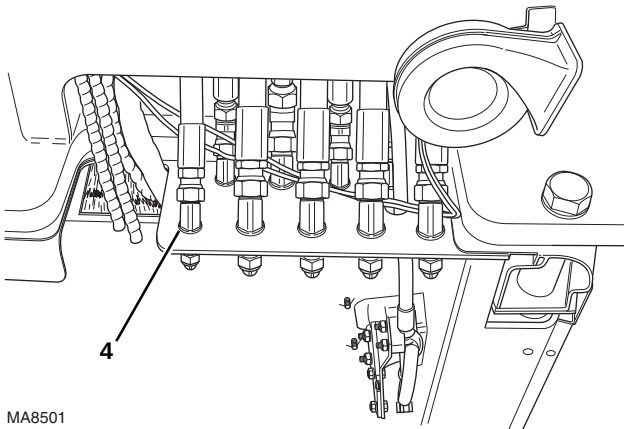
19. Carefully begin to lift the cab. Stop and check that all wiring, hydraulic hoses and fasteners are disconnected and removed.
20. When all wiring, hydraulic hoses and fasteners are disconnected or removed, carefully and slowly lift the cab and remove it from the frame. Readjust the position of the sling as needed to help balance the cab during removal.
21. When the cab is completely clear of the machine, carefully lower it to the ground. Block up or support the cab so that it does not move or fall. Assume that no personnel enter the cab while it is being removed from the machine.
22. Inspect the condition of the fittings, clamps, hydraulic hoses, etc. Replace parts as indicated by their condition.
23. Inspect and replace other machine parts that are exposed with the cab removed. Repair or replace as required.

4.5 CAB INSTALLATION

1. Block all four wheels to help prevent the machine from moving. Assume that there is sufficient overhead and side clearance for cab installation.
2. Attach a clevis (5) to each of the cab lifting brackets. Route a sling (6) with a minimum lifting capacity of 1000 lb (453 kg) to carry the weight of the cab through the clevis' to a hoist or over head crane. Make sure the sling is centered between the clevis' to ensure even lifting.
3. Carefully begin to align the cab with the mounting holes in the frame. Stop and check that wiring, hydraulic hoses, cables, etc. will not be pinched or damaged as the cab is positioned. Readjust the position of the sling as needed to help balance the cab during installation.
4. Install the two upper cab-to-frame capscrews and washers. Torque to 480 lb-ft (651 Nm).
5. Install the two lower cab-to-frame capscrews and washers. Torque to 480 lb-ft (651 Nm).
6. Under the cab, install new o-rings into the fittings. Lubricate the o-rings with clean hydraulic oil.

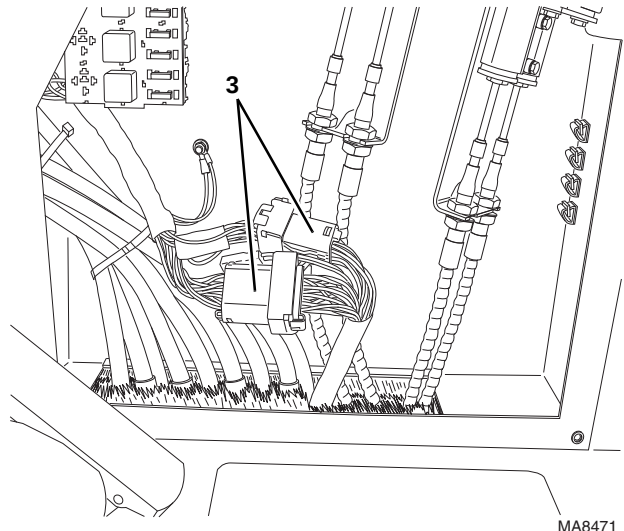


Cab and Covers



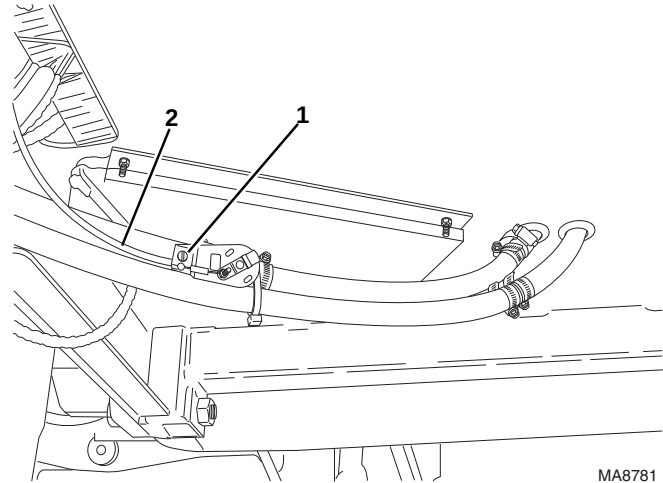
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7. Uncap and connect the previously labeled hydraulic hoses at the cab fittings (4).
8. Route the joystick control cables through the opening at the bottom of the cab. Install the joystick assemblies. Refer to Section 4.3.4, b. "Joystick Assembly Installation."



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9. Route the wiring harness connectors through the opening at the bottom of the cab. Connect the previously labeled connectors (2).
10. Install the console panel.
11. Install the transmission covers.
12. Working under the cab, connect the coolant hoses to the heater hoses.

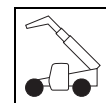


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13. Connect the heater control cable (2) to the heater control valve (1).
14. Fill the cooling system completely with coolant, allowing time for the coolant to fill the engine block. The cooling system capacity is listed in Section 2.4, "Fluid and Lubricant Capacities."
15. Properly connect the battery.
16. Carefully examine all cab components, fasteners, etc., one last time before engine start-up. Rectify any faulty conditions.
17. Start the engine and check the operation of all controls. Check for hydraulic fluid leaks. Check the hydraulic fluid level in the tank and add fluid as required.

Note: When the engine is initially started, run it briefly at low idle and check the machine for any visual sign of fluid leakage. STOP the engine immediately if any leakage is noted, and make any necessary repairs before continuing.

18. Wait for the engine to cool and check the coolant level. Add coolant to the overflow bottle as required to bring the coolant to the proper level.
19. Install the mirrors and all other cab components as needed, if removed.
20. Unblock the wheels.
21. Close and secure the rear door.

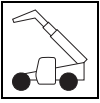


Section 5

Axles, Drive Shafts, Wheels and Tires

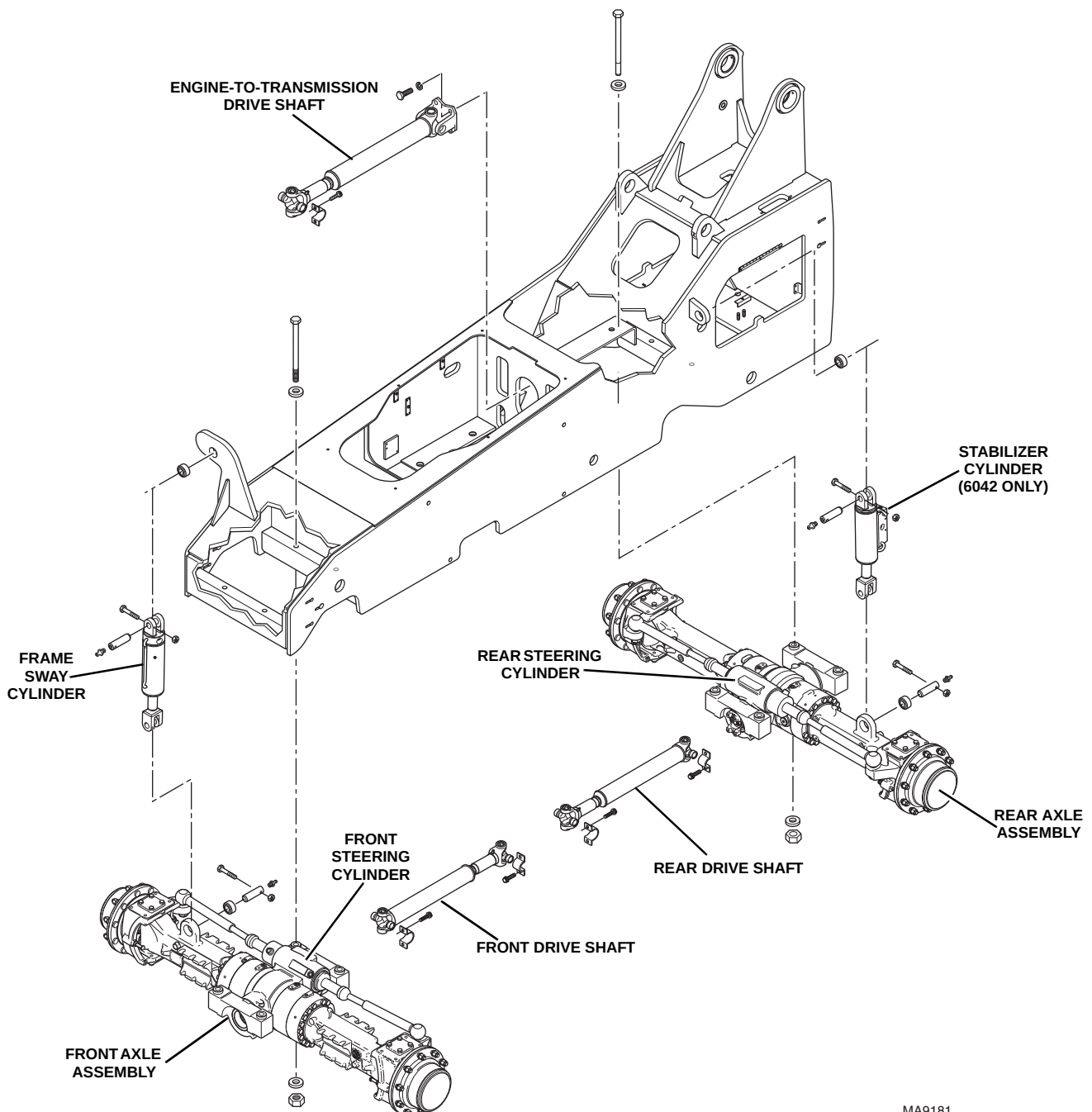
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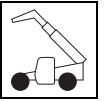


5.1 AXLE, DRIVE SHAFT AND WHEEL COMPONENT TERMINOLOGY (6036 & 6042)

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the axles, drive shafts, wheels and tires. The following illustration identifies the components that are referred to throughout this section.

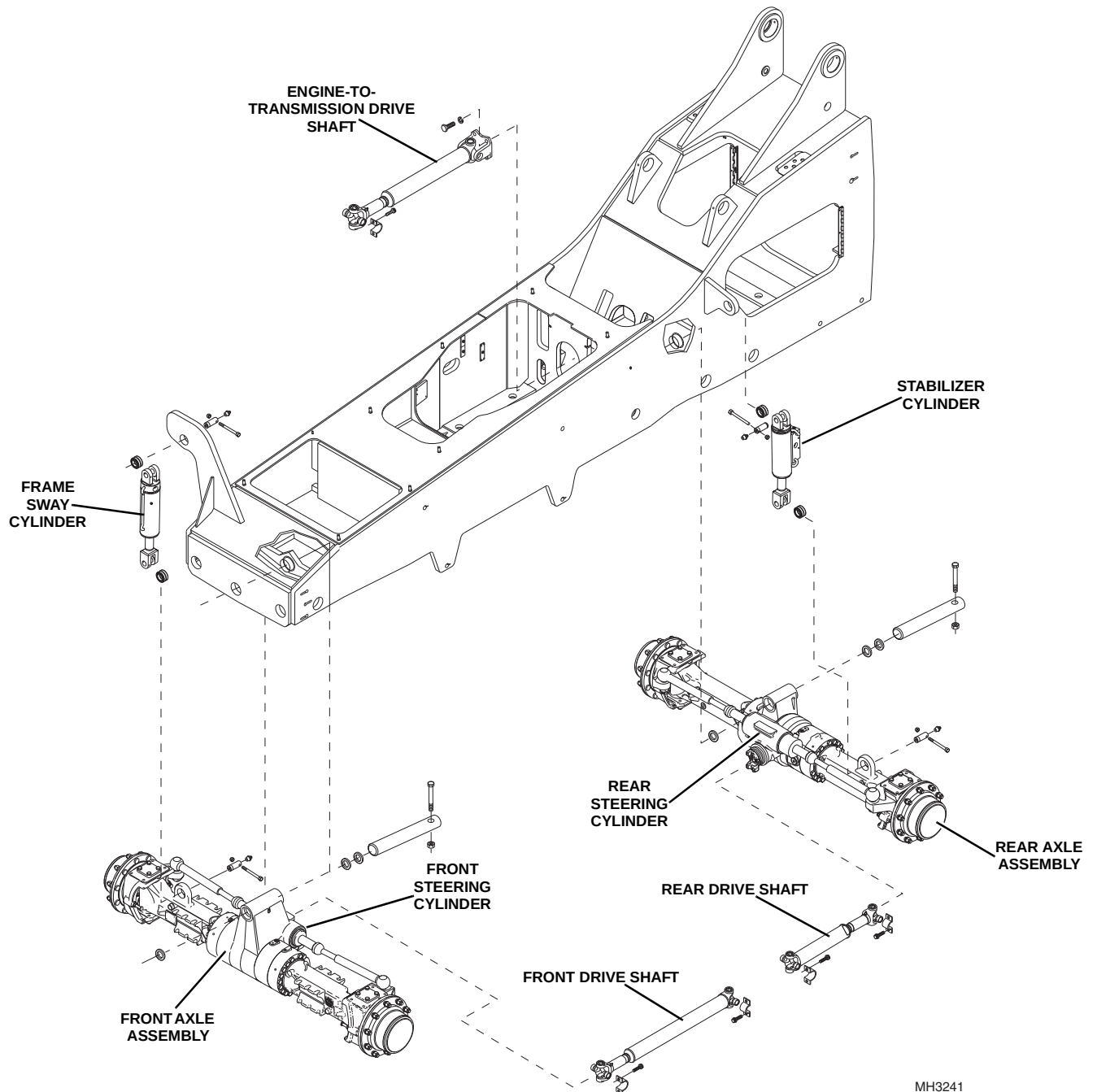


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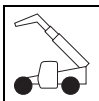


5.2 AXLE, DRIVE SHAFT AND WHEEL COMPONENT TERMINOLOGY (8042, 10042 & 10054)

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the axles, drive shafts, wheels and tires. The following illustration identifies the components that are referred to throughout this section.



MH3241



Axles, Drive Shafts, Wheels and Tires

5.3 GENERAL INFORMATION

WARNING

DO NOT service the machine without following all safety precautions as outlined in Section 1, "Safety Practices," of this manual.

Note: To help ensure optimum performance, the drive shaft assemblies are specially balanced as a unit at the factory. When servicing any flange yoke, slip yoke or drive shaft tube, order a complete assembly if components are bent or damaged. Refer to the appropriate parts manual for ordering information.

Before performing any inspection, maintenance or service operation, thoroughly clean the unit. The axles and drive shafts should be checked and repaired only by experienced service technicians who are aware of all safety instructions and particular component features.

Use suitable products to thoroughly clean all disassembled mechanical parts to help prevent personal injury to the worker and prevent damage to the parts. Carefully inspect the integrity of all moving parts (bearings, yokes, tubes, gears, shafts, etc.) and fasteners (nuts, bolts, washers, etc.) as they are subject to major stress and wear. Always replace any damaged, worn, cracked, seized or otherwise improper parts that could affect the safe and proper functioning of the machine, axles and drive shafts.

5.4 AXLE ASSEMBLIES

5.4.1 Axle Serial Number Plate

The front axle serial number plate is located on a mounting pad on the inboard portion of the right beam trumpet. The rear axle serial number plate is located on a mounting pad on the inboard portion of the left trumpet. Information on the serial number plate is required in correspondence regarding the axle.

Supply information from the axle serial number plate when communicating about an axle assembly or axle components.

5.4.2 Axle Specifications

General axle specifications are found in Section 2.4, "Fluid and Lubricant Capacities."

5.4.3 Axle Internal Service

Detailed axle service instructions (covering the axle, differential, brakes and wheel-end safety, repair, disassembly, reassembly, adjustment and troubleshooting information) are provided in the appropriate Axle Repair Manual.

8042 - Before S/N 0160038967 including 0160038971 & 0160038984

10042 - Before S/N 0160038368 including 0160038375, 0160038378, 0160038379, 0160038381 & 0160038383

10054 - Before S/N 0160038740 excluding 0160021270, 0160036713, 0160036715, 0160036721 & 0160036723

Machine	ZF Model	Axle	P/N
8042,10042 & 10054	MS-T 3060	Front	8990430
8042	MS-T 3045	Rear	8990419
10042,10054	MS-T 3055	Rear	8990419

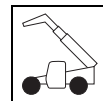
6036 & 6042

8042 - S/N 0160038967 & After excluding 0160038971 & 0160038984

10042 - S/N 0160038368 & After excluding 0160038375, 0160038378, 0160038379, 0160038381 & 0160038383

10054 - S/N 0160038740 & After including 0160021270, 0160036713, 0160036715, 0160036721 & 0160036723

Machine	ZF Model	Axle	P/N
6036,6042	MS-T 3045 II	Both	31200694
8042,10042 & 10054	MS-T 3060 II	Front	31200695
8042	MS-T 3045 II	Rear	31200694
10042,10054	MS-T 3055 II	Rear	31200694



5.4.4 Axle Maintenance

CLEANING: Clean parts with machined or ground surfaces (such as gears, bearings and shafts) with emulsion cleaners or petroleum-based cleaners. DO NOT steam clean internal components and the interior of the planetary hub and axle housing. Water can cause corrosion of critical parts. Rust contamination in the lubricant can cause gear and bearing failure. Remove old gasket material from all surfaces.

DRYING: Use clean, lintless towels to dry components after cleaning. DO NOT dry bearings by spinning them with compressed air; this can damage mating surfaces due to lack of lubrication. After drying, lightly coat components with oil or a rust-preventive chemical to help protect them from corrosion. If storing components for a prolonged period, wrap them in wax paper.

PERIODIC OPERATION REQUIREMENT: Every two weeks, drive the machine far enough to cause the drive-train components to make several complete revolutions. This will help ensure that internal components receive lubrication to minimize deterioration caused by environmental factors such as high humidity.

SUBMERSION: If the machine has been exposed to water deep enough to cover the hubs, disassemble the wheel ends and inspect for water damage and contamination. If the carrier housing was submerged in water, especially if the water level was above the vent tube (breather), drain the axle and inspect internal parts for water damage and contamination. Before assembling and refilling the unit with the specified lubricant(s), clean, examine and replace damaged parts as necessary.

Note: Use a suitable puller for bearing removal. Clean, inspect and lubricate all bearings just prior to reassembly. If replacement of a damaged bearing cup or cone is necessary, replace the cup and cone as a set.

5.4.5 Axle Replacement (6036 & 6042)

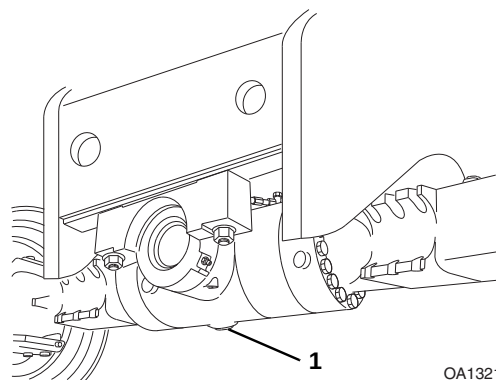
a. Axle Removal

The front and rear axle assemblies differ in that the front axle assembly is equipped with a parking brake mechanism and a limited-slip feature; the rear axle has neither. The following steps outline a typical axle removal procedure, suitable for either the front or the rear axle assembly.

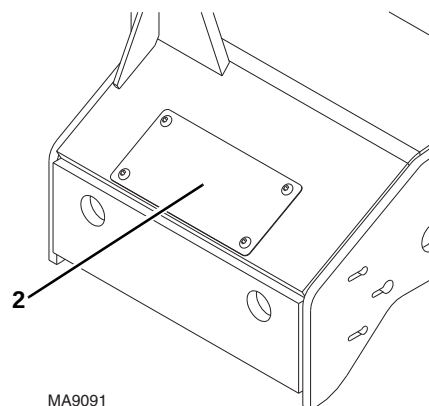
Cleanliness is extremely important. Before attempting to remove the axle, thoroughly clean the machine. Avoid spraying water or cleaning solution on the stabilizer solenoids and other electrical components. If using a steam cleaner, seal all openings before steam cleaning.

Note: Clear the work area of all debris, unnecessary personnel, etc. Allow sufficient space to raise the machine and to remove the axle.

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, straighten all wheels and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. If the axle will be disassembled after removal, place a suitable receptacle under the axle drain plug (1). Remove the drain plug and allow the axle oil to drain into the receptacle. Transfer the used axle oil into a suitable covered container, and label the container as "Used Oil." Dispose of used oil at an approved recycling facility.



6. **Front Axle:** Remove the front access panel (2) to gain access to the front axle hose connections and mounting bolts.
Rear Axle: Open the right and left side engine compartment doors to gain access to the rear hose connections and mounting bolts.



Axles, Drive Shafts, Wheels and Tires

7. Label, disconnect and cap the steering and brake lines at the axle. Cap all fittings to prevent dirt and debris from entering the hydraulic system. Wipe up any spilled oil.
8. Block the front and rear of both tires on the axle that is not being removed. Ensure that the machine will remain in place during axle removal before proceeding.
9. Raise the machine using a suitable jack or hoist. Place suitable supports under both sides of the frame and lower the machine onto the supports. Ensure that the machine will remain in place during axle removal.
10. Support the axle that is being removed with a suitable jack, hoist or overhead crane and sling. DO NOT raise the axle or the machine.
11. Remove both wheel and tire assemblies from the axle that is being removed. (Refer to Section 5.7.1, "Removing Wheel and Tire Assembly from Machine.")

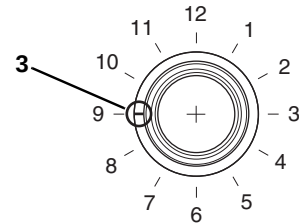
Note: The wheel and tire assemblies must be re-installed later with the directional tread pattern "arrows" facing in the direction of forward travel.

12. Remove the drive shaft assembly. Refer to Section 5.6.3, "Drive Shaft Removal."
13. Remove the capscrew and locknut securing the lower position cylinder-mount pin to the cylinder. Tap the cylinder mount pin out, and move the cylinder to prevent it from interfering with axle removal.
14. Remove the capscrews securing the axle supports to the machine frame.
15. Remove the axles from the machine using the jack, hoist or overhead crane and sling supporting the axle. DO NOT raise or otherwise disturb the machine while removing the axle. Balance the axle and prevent it from tipping, turning or falling while removing it from beneath the machine. Place the axle on a suitable support or holding stand.

b. Axle Installation

1. Before proceeding, ensure that the machine will remain in place during axle installation. Block the front and rear of both tires on the axle that is already installed on the machine.
2. If applicable, raise the machine using a suitable jack or hoist. Place suitable supports beneath the frame and lower the machine onto the supports, allowing enough room for axle installation. Ensure that the machine will remain in place during axle installation.

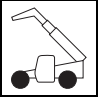
3. Using a suitable jack, hoist or overhead crane and sling, remove the axle from its support or holding stand. Balance the axle and prevent it from tipping, turning or falling while positioning it beneath the machine. DO NOT raise or otherwise disturb the machine while installing the axle. Keep the axle supported and balanced on the jack, hoist or overhead crane and sling throughout the installation procedure.
4. Install the capscrews securing the axle to the frame. Torque to 600-680 lb-ft (813-922 Nm).



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Note: If new frame sway (front) or stabilizer (rear) cylinder bearings (3) have been installed in the axles or machine frame, the fracture in the bearing race must be positioned at the 9 o'clock position as shown below.

5. Move the cylinder into position on the axle cylinder anchor. Insert a cylinder-mount pin through the cylinder and cylinder anchor. Secure the cylinder-mount pin with one capscrew and new locknut.
6. Apply multi-purpose grease through the self-tapping lube fitting to lubricate the self-align bearing and the cylinder-mount pin.
7. Install the drive shaft assemblies. Refer to Section 5.6.5, "Drive Shaft Installation."
8. If reinstalling an axle previously removed from the machine, position the driveshaft yoke on the axle according to the alignment marks made earlier. If installing a new axle, note the position of the driveshaft yoke at the transmission. Align the driveshaft yoke on the axle in the same plane as the yoke on the transmission.
9. Install the wheel and tire assemblies. Refer to Section 5.7.2, "Installing Wheel and Tire Assembly onto Machine."
10. Carefully remove the jack, hoist or overhead crane and sling supporting the axle.
11. Carefully raise the machine using a suitable jack or hoist. Remove the supports from beneath the frame and lower the machine to the ground.
12. Remove the blocks from the front and rear of both tires on the other axle.



Note: ALWAYS use new o-rings when servicing the machine.

13. Install new o-rings into the fittings. Lubricate the o-rings with clean hydraulic oil.
14. Uncap and connect the steering and brake lines at their axle fittings.
15. Check the hydraulic reservoir oil level.
16. Properly connect the battery.
17. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
18. Start the engine. Turn the steering wheel several times lock to lock, operate the frame tilt function several times in both directions and check the function of the brakes. Check for hydraulic leaks, and tighten or repair as necessary.
19. **Front Axle:** Install the front access panel.
20. Close and secure the rear door.

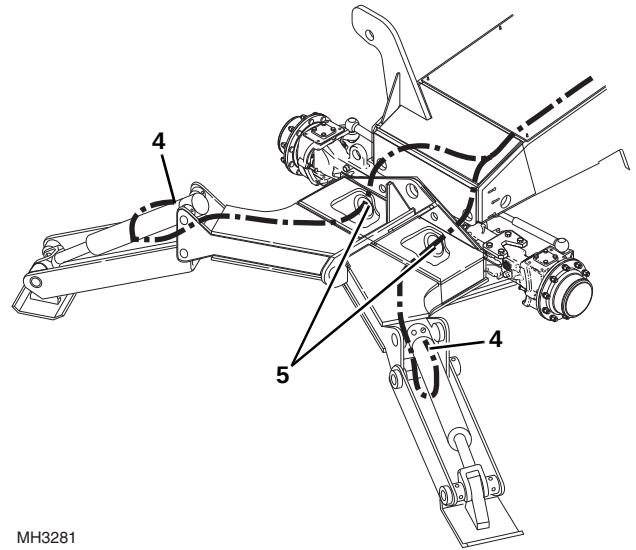
Note: The service brake circuit will need to be bled after axle installation. Refer to Section 8.7.4, "Brake Test."

5.4.6 Axle Replacement (8042, 10042 & 10054)

a. Outrigger Removal (10042 & 10054 only)

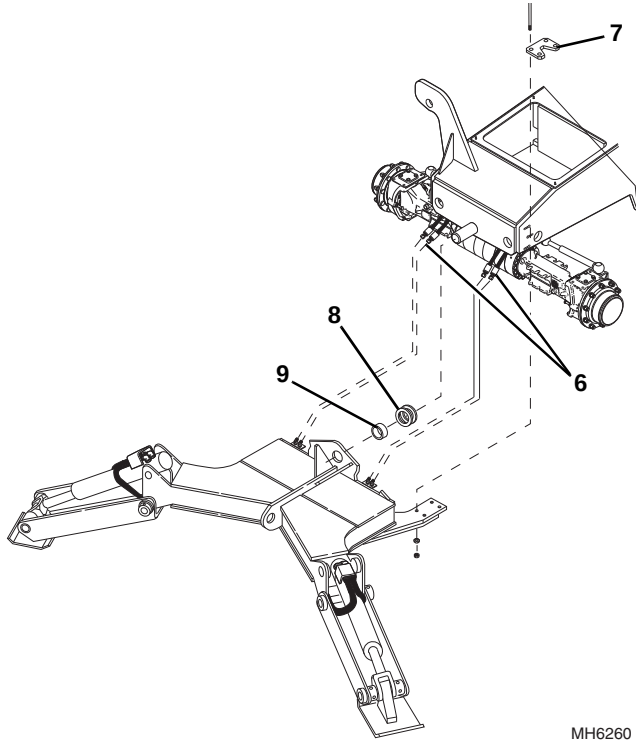
On Models 10042 and 10054 equipped with outriggers, it is necessary to remove the outrigger assembly before removing the front axle.

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, straighten all wheels and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



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5. Label and disconnect the wiring harness connectors at both outrigger cylinder pressure switches (4). Remove the wire ties securing the wiring harness to the outrigger cylinders.
6. Tie a length of string to each pressure switch wiring connector, and pull the harness out through the openings (5) at the rear of the outrigger housing.
7. Untie the strings from the wiring connectors and tape, or otherwise secure the ends of the strings to the outrigger housing. These strings will be used to pull the harness through the housing during installation.



8. Label, disconnect and cap the outrigger hydraulic hoses (6). Cap all fittings to keep dirt and debris from entering the hydraulic system.
 9. Support the outrigger assembly using a suitable jack, hoist or overhead crane.
 10. Remove the capscrews, hex nuts, flat washers and mount plates (7).
- Note:** Record the number and thickness of shims to ensure correct installation.
11. Remove the outrigger assembly using a suitable jack, hoist or overhead crane. Remove the shims (8) from the pivot pin.
 12. Move the outrigger assembly away from the machine and carefully lower it to the ground. Block up or support the assembly so that it does not move or fall.
 13. Inspect the pivot bearing (9). Replace the bearing if worn or damaged.

b. Outrigger Installation

1. Using a suitable jack, hoist or overhead crane and sling, remove the outrigger assembly from its supports. Balance the assembly and prevent it from tipping, turning or falling while positioning it on the machine. DO NOT raise or otherwise disturb the machine while installing the outrigger assembly.

Keep the assembly supported and balanced during the installation procedure.

2. Place the same number and thickness of shims (8) on the pivot pin, as recorded during removal.
3. Position the outrigger assembly onto the machine, aligning the hole in the assembly on the axle pivot pin and the mounting plate under the axle flanges.
4. Install the two mount plates (7) onto the top of the axle and secure with the previously used hardware.

Note: ALWAYS use new o-rings when servicing the machine.

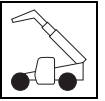
5. Install new o-rings into the fittings. Lubricate the o-rings with clean hydraulic oil.
6. Uncap and connect the previously labeled hydraulic hoses (6) to their appropriate locations.
7. Tie the strings left in the outrigger housing during removal to each pressure switch wiring connector, and pull the harness through the outrigger housing.
8. Connect the wiring connectors to the outrigger cylinder pressure switches. Secure the harnesses to the cylinders with wire ties.
9. Check the hydraulic reservoir oil level.
10. Properly connect the battery.
11. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
12. Start the engine. Turn the steering wheel several times lock to lock, operate the frame tilt function several times in both directions and check the function of the brakes. Check for hydraulic leaks, and tighten or repair as necessary.

c. Axle Removal

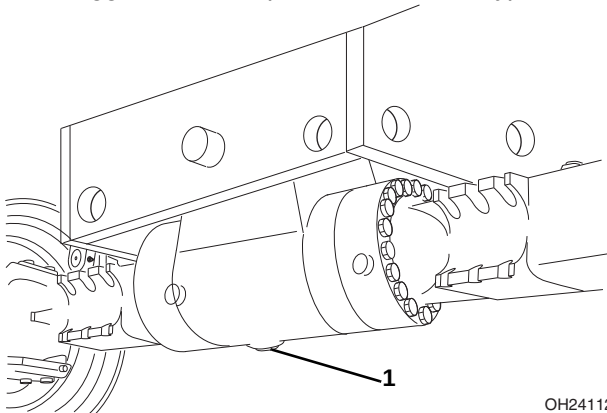
The front and rear axle assemblies differ in that the front axle assembly is equipped with a parking brake mechanism and a limited-slip feature; the rear axle has neither. The following steps outline a typical axle removal procedure, suitable for either the front or the rear axle assembly.

Cleanliness is extremely important. Before attempting to remove the axle, thoroughly clean the machine. Avoid spraying water or cleaning solution on the stabilizer solenoids and other electrical components. If using a steam cleaner, seal all openings before steam cleaning.

Note: Clear the work area of all debris, unnecessary personnel, etc. Allow sufficient space to raise the machine and to remove the axle.



1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, straighten all wheels and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the fender assembly (if equipped).
6. Models 10042 and 10054, Front Axle Only: Remove outrigger assembly. Refer to Section 5.4.6, a. "Outrigger Removal (10042 & 10054 only)."

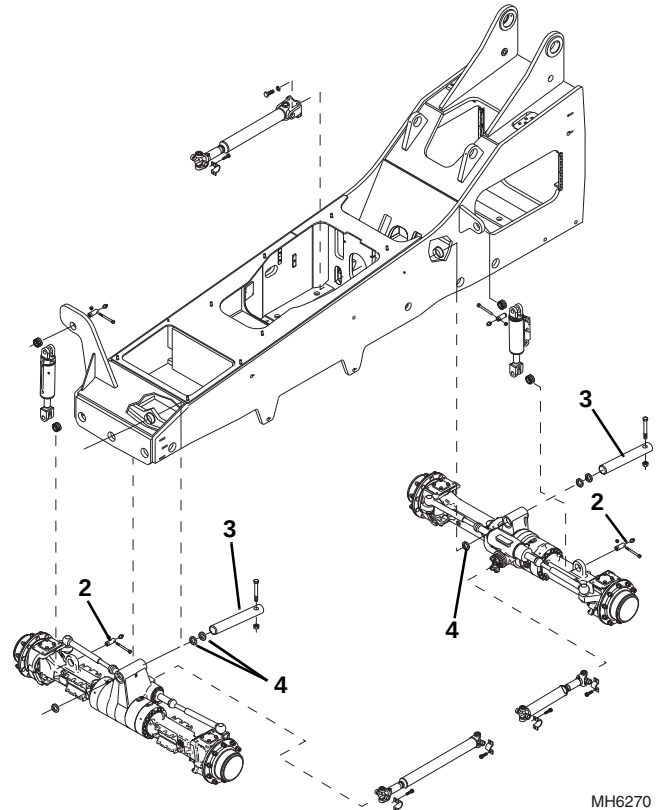


7. If the axle will be disassembled after removal, place a suitable receptacle under the axle drain plug (1). Remove the drain plug and allow the axle oil to drain into the receptacle. Transfer the used axle oil into a suitable covered container, and label the container as "Used Oil." Dispose of used oil at an approved recycling facility.
8. Label, disconnect and cap the steering and brake lines at the axle. Cap all fittings to prevent dirt and debris from entering the hydraulic system. Wipe up any spilled oil.
9. Block the front and rear of both tires on the axle that is not being removed. Ensure that the machine will remain in place during axle removal before proceeding.
10. Raise the machine using a suitable jack or hoist. Place suitable supports under both sides of the frame and lower the machine onto the supports. Ensure that the machine will remain in place during axle removal.
11. Support the axle that is being removed with a suitable jack, hoist or overhead crane and sling. DO NOT raise the axle or the machine.

12. Remove both wheel and tire assemblies from the axle that is being removed. (Refer to Section 5.7.1, "Removing Wheel and Tire Assembly from Machine.")

Note: The wheel and tire assemblies must be re-installed later with the directional tread pattern "arrows" facing in the direction of forward travel.

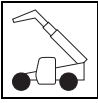
13. Remove the drive shaft assembly. Refer to Section 5.6.3, "Drive Shaft Removal."



14. Remove the capscrew and locknut securing the lower position cylinder-mount pin (2) to the cylinder. Tap the cylinder mount pin out, and move the cylinder to prevent it from interfering with axle removal.
15. Remove the capscrew and locknut securing the axle pivot pin (3) to the frame.

Note: Record the number and location of shims (4) to ensure correct installation.

16. Remove the pivot pin and shims.
17. Remove the axles from the machine using the jack, hoist or overhead crane and sling supporting the axle. DO NOT raise or otherwise disturb the machine while removing the axle. Balance the axle and prevent it from tipping, turning or falling while

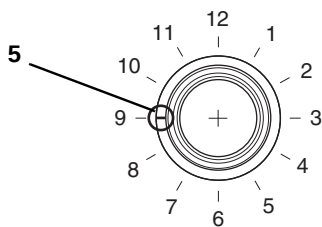


Axles, Drive Shafts, Wheels and Tires

removing it from beneath the machine. Place the axle on a suitable support or holding stand.

d. Axle Installation

1. Before proceeding, ensure that the machine will remain in place during axle installation. Block the front and rear of both tires on the axle that is already installed on the machine.
2. If applicable, raise the machine using a suitable jack or hoist. Place suitable supports beneath the frame and lower the machine onto the supports, allowing enough room for axle installation. Ensure that the machine will remain in place during axle installation.
3. Using a suitable jack, hoist or overhead crane and sling, remove the axle from its support or holding stand. Balance the axle and prevent it from tipping, turning or falling while positioning it beneath the machine. DO NOT raise or otherwise disturb the machine while installing the axle. Keep the axle supported and balanced on the jack, hoist or overhead crane and sling throughout the installation procedure.
4. Position the axle under the frame, and align the pivot pin bearings with the holes in the frame.
5. Coat the axle pivot pin (3) with a light film of clean engine or hydraulic oil; DO NOT use an anti-seize compound.
6. Install the axle pivot pin and shims (4). Add or remove shims until a maximum gap of 0.6 in (1.5 mm) is obtained. Balance the number and thickness of shims equally of both sides. Secure the pivot pin with one capscrew and a new locknut.



Note: If new frame sway (front) or stabilizer (rear) cylinder bearings (5) have been installed in the axles or machine frame, the fracture in the bearing race must be positioned at the 9 o'clock position as shown below.

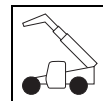
7. Move the cylinder into position on the axle cylinder anchor. Insert a cylinder-mount pin (2) through the cylinder and cylinder anchor. Secure the cylinder-mount pin with one capscrew and new locknut.

8. Apply multi-purpose grease through the self-tapping lube fitting to lubricate the self-align bearing and the cylinder-mount pin.
9. Install the drive shaft assemblies. Refer to Section 5.6.5, "Drive Shaft Installation."
10. If reinstalling an axle previously removed from the machine, position the driveshaft yoke on the axle according to the alignment marks made earlier. If installing a new axle, note the position of the driveshaft yoke at the transmission. Align the driveshaft yoke on the axle in the same plane as the yoke on the transmission.
11. Install the wheel and tire assemblies. Refer to Section 5.7.2, "Installing Wheel and Tire Assembly onto Machine."
12. Carefully remove the jack, hoist or overhead crane and sling supporting the axle.
13. Carefully raise the machine using a suitable jack or hoist. Remove the supports from beneath the frame and lower the machine to the ground.
14. Remove the blocks from the front and rear of both tires on the other axle.

Note: ALWAYS use new o-rings when servicing the machine.

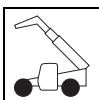
15. Install new o-rings into the fittings. Lubricate the o-rings with clean hydraulic oil.
16. Uncap and connect the steering and brake lines at their axle fittings.
17. Models 10042 and 10054, Front Axle Only: Install outrigger assembly. Refer to Section 5.4.6, b. "Outrigger Installation."
18. Check the hydraulic reservoir oil level.
19. Properly connect the battery.
20. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
21. Start the engine. Turn the steering wheel several times lock to lock, operate the frame tilt function several times in both directions and check the function of the brakes. Check for hydraulic leaks, and tighten or repair as necessary.
22. Install the fender assembly (if equipped).
23. Close and secure the rear door.

Note: The service brake circuit will need to be bled after axle installation. Refer to Section 8.7.4, "Brake Test."



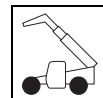
5.5 AXLE ASSEMBLY AND DRIVE SHAFT TROUBLESHOOTING

Problem	Cause	Remedy
1. Excessive axle noise while driving.	1. Oil level too low.	1. Fill oil to correct level. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Axle and/or wheel end housings filled with incorrect oil or oil level low.	2. Drain axle and/or wheel end housings and fill to correct level with Mobilfluid 424® ISO 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	3. Incorrect alignment of ring and pinion gears.	3. Correct alignment by adding or removing shims as needed.
	4. Incorrect pinion (input) shaft bearing preload.	4. Correct bearing preload by adding or removing shims as needed.
	5. Worn or damaged bearings.	5. Replace bearings as needed.
	6. Worn or broken gear teeth.	6. Replace gears as needed.
	7. Contamination in the axle.	7. Drain axle and/or wheel end housings and fill to correct level with Mobilfluid 424® ISO 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	8. Axle housing damaged.	8. Replace damaged parts.
2. Intermittent noise when traveling.	1. Universal joint(s) worn or damaged.	1. Repair or replace universal joints as needed.
	2. Differential ring and/or pinion gears damaged.	2. Determine cause and repair as needed.
3. Vibration or intermittent noise when traveling.	1. Drive shaft universal joint assembly(ies) incorrectly tightened.	1. Tighten capscrews to correct torque.
	2. Drive shaft universal joint(s) worn or damaged.	2. Repair or replace universal joints as needed.
	3. Drive shaft(s) damaged/unbalanced.	3. Replace drive shaft(s) as needed.

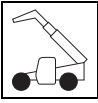


Axles, Drive Shafts, Wheels and Tires

Problem	Cause	Remedy
4. Oil leaking from axle (differential housing and/or axle housings).	1. Drain and/or inspection plugs loose and/or o-rings damaged or missing. 2. Hose fittings loose. 3. Axle shaft seal damaged or missing and/or worn or damaged shaft sealing surfaces. 4. Input shaft multi-seal ring damaged or missing and/or worn or damaged pinion (input) shaft sealing surfaces. 5. Axle casing to brake housing and/or brake housing to differential assembly o-rings and/or seals worn or damaged. 6. Axle housing mounting nuts and capscrews loose. 7. Differential and/or axle housing(s) damaged.	1. Replace o-rings as needed and tighten plugs to 96 lb-ft (130 Nm). 2. Tighten fittings. 3. Replace seal and/or joint coupling fork shaft (axle shaft). 4. Replace multi-seal ring and/or input shaft. Adjust ring and pinion alignment and bearing preload as described in the Dana Repair Manuals. 5. Replace o-rings and seals. 6. Tighten housing nuts and capscrews to 288 lb-ft (390 Nm). 7. Replace housing(s) as needed.
5. Oil leaking from wheel end housing (planet carrier).	1. Oil level plugs loose and/or o-rings damaged or missing. 2. O-ring between hub and housing (planet carrier) damaged or missing. 3. Shaft seal damaged or missing and/or worn or damaged shaft sealing surfaces. 4. Housing capscrews loose. 5. Housing (planet carrier) damaged.	1. Replace o-rings as needed and tighten plugs to 96 lb-ft (130 Nm). 2. Replace o-ring. 3. Replace seal and/or fork joint shaft. 4. Tighten housing capscrews to 41 lb-ft (55 Nm). 5. Replace housing (planet carrier).
6. Oil leaking from steering cylinder.	1. Hose fittings loose. 2. Steering cylinder o-rings and/or seals worn or damaged. 3. Piston rod seal worn or damaged. 4. Cylinder tube damaged.	1. Tighten fittings. 2. Replace o-rings and seals. 3. Replace piston rod seal. 4. Replace cylinder tube.



Problem	Cause	Remedy
7. Axle overheating.	1. Oil level too high. 2. Axle and/or wheel end housings filled with incorrect oil or oil contaminated or oil level low. 3. Dragging park brake.	1. Fill oil to correct level with Mobilfluid 424® ISO 46. Refer to Section 2.4, "Fluid and Lubricant Capacities." 2. Drain axle and fill to correct level with Mobilfluid 424® ISO 46. Refer to Section 2.4, "Fluid and Lubricant Capacities." 3. Adjust park brake cable as needed.
8. High steering effort required.	1. Steering (hydraulic) system not operating properly. 2. Excessive joint housing swivel bearing preload. 3. Worn or damaged swivel bearings.	1. Refer to Section 8.4, "Hydraulic Circuits." 2. Correct bearing preload by adding or removing shims as needed. 3. Replace swivel bearings as needed.
9. Slow steering response.	1. Steering (hydraulic) system not operating properly. 2. Steering cylinder leaking internally.	1. Refer to Section 8.4, "Hydraulic Circuits." 2. Repair or replace steering cylinder as needed.
10. Excessive noise when brakes are engaged.	1. Brake discs worn. 2. Brake discs damaged.	1. Check brake discs for wear. Refer to Section 5.8.1, "Brake Disc Inspection." 2. Replace brake discs.
11. Brakes will not engage.	1. Brake (hydraulic) system not operating properly. 2. Brake piston o-rings and seals damaged (leaking).	1. Refer to Section 8.4, "Hydraulic Circuits." 2. Replace o-rings and seals.
12. Brakes will not hold the machine or braking power reduced.	1. Brake discs worn. 2. Brake (hydraulic) system not operating properly. 3. Brake piston o-rings and seals damaged (leaking).	1. Check brake discs for wear. Refer to Section 5.8.1, "Brake Disc Inspection." 2. Refer to Section 8.4, "Hydraulic Circuits." 3. Replace o-rings and seals.



5.6 DRIVE SHAFTS

5.6.1 Drive Shaft Inspection and Service

Whenever servicing the machine, conduct a visual inspection of the drive shafts and cross and bearing assemblies (universal joints, or U-joints). A few moments spent doing this can help prevent further problems and down time later.

Inspect areas where the drive shaft flange yokes and slip yokes mount to the drive shafts. Attempt to turn each drive shaft in both directions. Look for excessive looseness, missing parts, cracks or other damage. Worn or damaged drive shafts and cross and bearing assemblies may cause an excessive amount of vibration or noise.

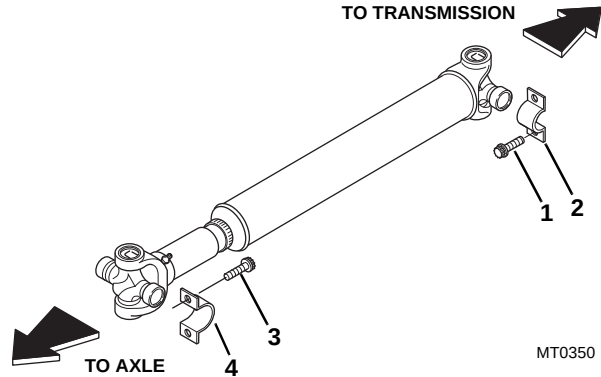
Note: Any bolt removed from the drive shaft assembly **MUST** be replaced. Do Not re-torque.

5.6.2 Drive Shaft Maintenance

Refer to Section 2.6, "Lubrication Schedules" for information regarding the lubrication of the grease fittings on the drive shafts.

5.6.3 Drive Shaft Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the engine cover. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Block the wheels.
6. The drive shaft assembly is a balanced assembly. Mark the yoke and axle, transmission and the shaft and slip yoke so that these components can be returned to their original positions when reinstalled. Yokes at both ends of the drive shaft must be in the same plane to help prevent excessive vibration.



7. Remove the four bolts (1) and two straps (2) securing the bearing cross to the transmission output shaft flange. Discard bolts.
8. Remove the four bolts (3) and two straps (4) securing the bearing crosses to the axle. Discard bolts.
9. Remove the front drive shaft assembly.
10. Repeat the above procedure on the rear drive shaft.

5.6.4 Drive Shaft Cleaning and Drying

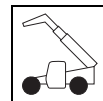
1. Disassemble and clean all parts using an approved cleaning fluid. Allow to dry.
2. Remove and burrs or rough spots from all machined surfaces. Re-clean and dry as required.

5.6.5 Drive Shaft Installation

1. Raise the drive shaft assembly into position. The slip-yoke end of the drive shaft mounts toward the axle. If reinstalling a drive shaft previously removed, align the flange yokes according to the alignment marks made during removal.

Note: The yokes at both ends of the drive shaft must be in the same plane to help prevent excessive vibration.

2. Apply Loctite® 242™ to all mounting bolts.
3. Install the two straps (2) and four new bolts (1) securing the bearing crosses to the transmission. Torque bolts to 55-60 lb-ft (75-81 Nm).
4. Install the two straps (4) and four new bolts (3) securing the bearing crosses to the axle. Torque bolts to 55-60 lb-ft (75-81 Nm).
5. Repeat the above procedure on the rear drive shaft.



5.7 WHEELS AND TIRES

WARNING

Mismatched tire sizes, ply ratings or mixing of tire types (radial tires with bias-ply tires) may compromise machine stability and may cause machine to tip over.

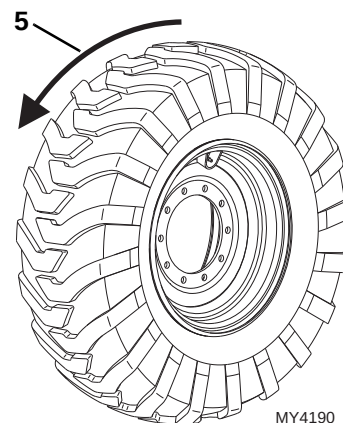
It is recommended that a replacement tire to be the same size, ply and brand as originally installed. Refer to the appropriate parts manual for ordering information. If not using an approved replacement tire, It is recommended that replacement tires have the following characteristics:

- Equal or greater ply/load rating and size of original.
- Tire tread contact width equal or greater than original.
- Wheel diameter, width and offset dimensions equal to the original.
- Approved for the application by the tire manufacturer (including inflation pressure and maximum tire load).

The rims installed have been designed for stability requirements which consist of track width, tire pressure and load capacity. Size changes such as rim width, center piece location, larger or smaller diameter, etc., without written factory recommendations, may result in unsafe condition regarding stability.

Foam filled tires have a positive effect on the weight, stability and handling characteristics of the machine, especially under load. The use of hydrofill as a tire-fill substance is not recommended because of possible environmental impact.

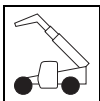
Large-bore valve stems are used to help expedite tire inflation and deflation. An inner tube may be used if a tire does not provide an airtight seal. Check tire inflation pressures when the tires are cold. When mounting a tire on the wheel, the tire must be mounted on the wheel respective of the directional tread pattern of the tire; this produces a left or right tire and wheel assembly.



The wheel and tire assemblies must be installed with the directional tread pattern “arrows” (5) facing in the direction of forward travel.

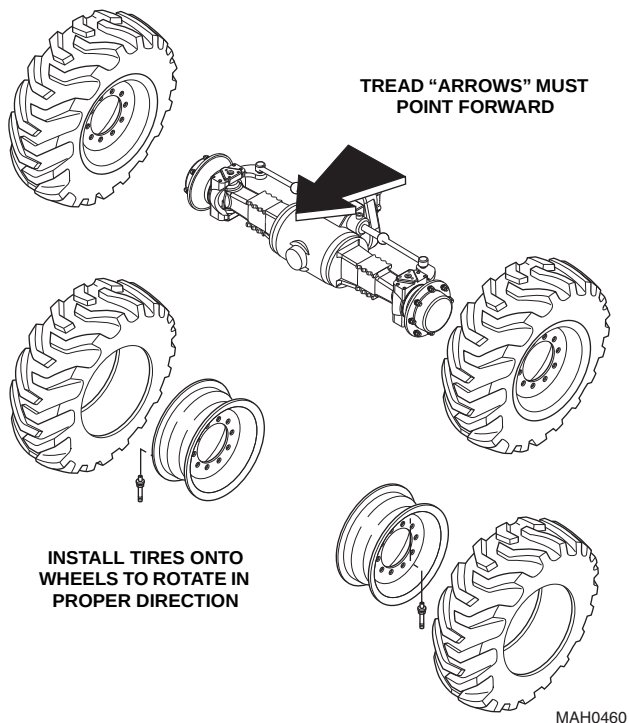
5.7.1 Removing Wheel and Tire Assembly from Machine

1. Park the machine on a firm, level surface, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place an Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Loosen but **DO NOT** remove the lug nuts on the wheel and tire assembly to be removed.
4. Place a suitable jack under the axle pad closest to the wheel being removed. Raise the machine and position a suitable support beneath the axle. Allow sufficient room to lower the machine onto the support and to remove the wheel and tire assembly.
5. Lower the machine onto the support.
6. Remove lug nuts and lug washers in an alternating pattern.
7. Remove the wheel and tire assembly from the machine.



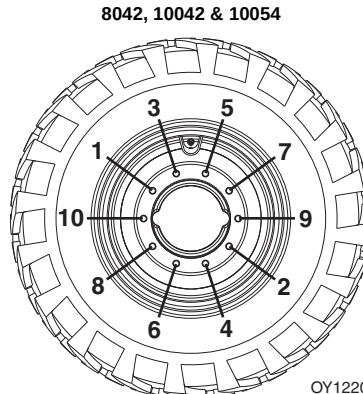
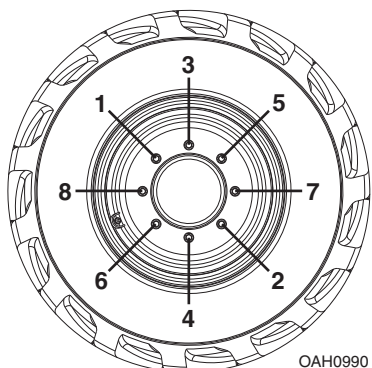
5.7.2 Installing Wheel and Tire Assembly onto Machine

Note: The wheel and tire assemblies must be installed with the directional tread pattern “arrows” facing in the direction of forward travel.



1. Position wheel onto studs on wheel end of axle.
2. Install wheel lug washers.
3. Start all nuts by hand to prevent cross threading. DO NOT use a lubricant on threads or nuts.

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4. Tighten lug nuts in an alternating pattern as indicated in figure. Torque to 430-470 lb-ft (583-637 Nm).
5. Remove machine from supports.

5.8 BRAKES

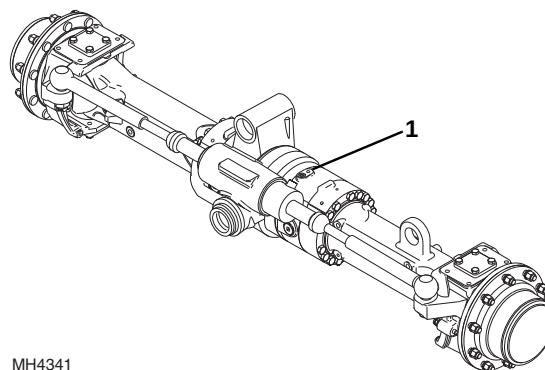
5.8.1 Brake Disc Inspection

Check the brake discs for wear every 1,000 hours of operation or yearly.

For more information on brake disc inspection, refer to the appropriate axle repair manual.

a. Front Axle

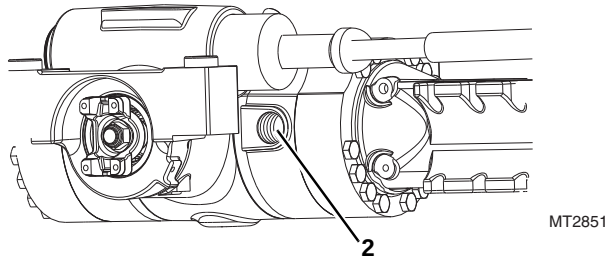
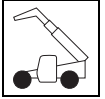
1. Block all four wheels to help prevent the machine from moving after the parking brake is disabled.



2. Attach a remote portable hydraulic pressurizing unit to the breather port (1) on the axle.

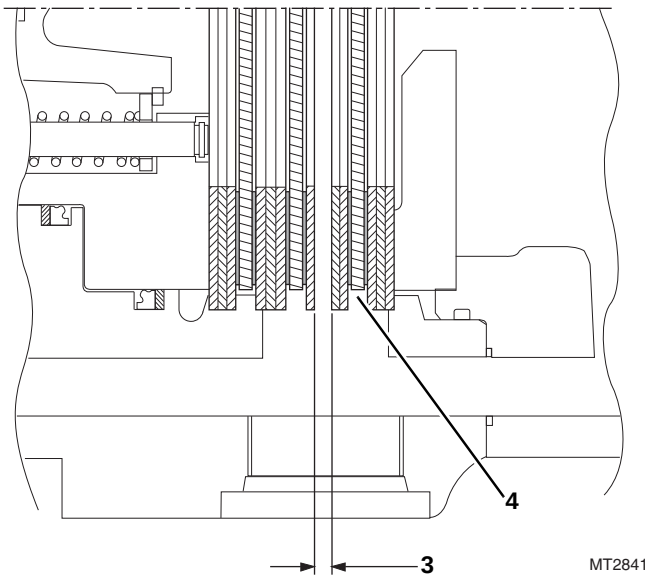
Note: DO NOT turn the key switch to the ON position. DO NOT release the parking brake switch. Oil pressure will be lost and parking brake will be engaged.

3. Pressurize the parking brake with the pressurizing unit. Close the needle valve on the pressurizing unit.



4. Working through the level plug hole (2), carefully use a screwdriver to spread the brake discs apart.

Note: DO NOT damage the surfaces of the brake discs when spreading the brake discs.



5. Using a feeler gauge, check the gap (3) between the brake discs (4). If the measurement is greater than the maximum gap, replace the brake discs.

Machine	Maximum Gap
6036, 6042	4,25 mm (0.16 in) (3 disc version) 5,60 mm (0.22 in) (4 disc version)
8042	5,60 mm (0.22 in)
10042, 10054	6,75 mm (0.26 in)

Note: If the brake discs are worn beyond their tolerance, the brake disc must be replaced on both sides of the axle at the same time.

6. Repeat steps 4 and 5 for the other side of the axle.

7. Fill the axle with Mobilfluid 424® Tractor Hydraulic Fluid (ISO 46) through the axle fill hole until the oil level is even with both axle level holes. Fill the axle slowly, allow time for the oil to run across the differential.
8. Reassemble the level plugs using new o-rings.
9. Install the axle fill plug into axle housing.
10. Remove the remote portable hydraulic pressurizing unit from the port.

b. Rear Axle

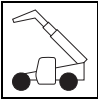
1. Block all four wheels to help prevent the machine from moving after the parking brake is disabled.
2. Working through the level plug hole (2), carefully use a screwdriver to spread the brake discs apart.

Note: DO NOT damage the surfaces of the brake discs when spreading the brake discs.

3. Using a feeler gauge, check the gap (3) between the brake discs (4). If the gap is greater than 0.16 in (4,25 mm) for a 3 disc axle, replace the brake discs. If the gap is greater than 0.22 in (5,60 mm) for a 4 disc axle, replace the brake discs.

Note: If the brake discs are worn beyond their tolerance, the brake disc must be replaced on both sides of the axle at the same time.

4. Repeat steps 2 and 3 for the other side of the axle.
5. Fill the axle with Mobilfluid 424® Tractor Hydraulic Fluid (ISO 46) through the axle fill hole until the oil level is even with both axle level holes. Fill the axle slowly, allow time for the oil to run across the differential.
6. Reassemble the level plugs using new o-rings.
7. Install the axle fill plug into axle housing.



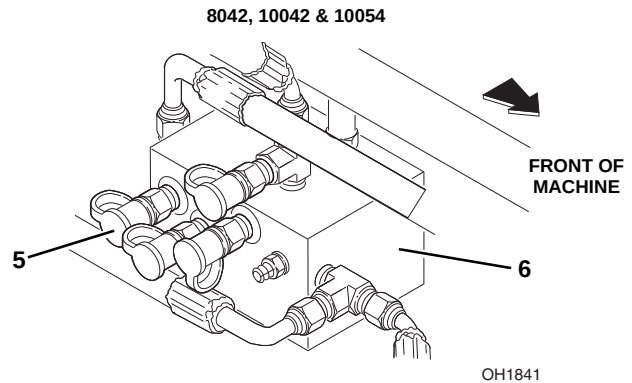
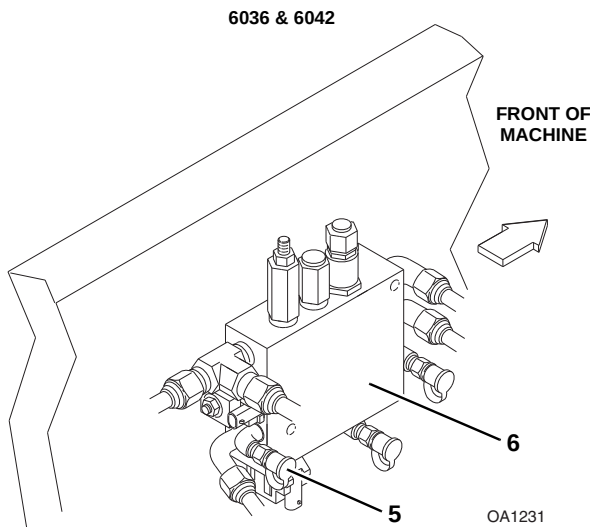
5.9 TOWING A DISABLED MACHINE

Towing a disabled machine should only be attempted as a last resort, after exhausting all other options. Make every effort to repair the machine, and move it under its own power. Towing the machine improperly can result in damage to the machine drivetrain.

Note: *In the event the machine is disabled and cannot be moved under engine power, the situation must be properly evaluated and dealt with on an individual basis. Contact your local JLG distributor for specific instructions for your particular situation.*

If it is necessary to tow the machine a short distance to avoid a potentially hazardous situation such as being in an unsafe area on the worksite or on a roadway, prepare the machine for towing as follows:

1. Remove the load from the machine.
2. Block all four wheels to help prevent the machine from moving after the parking brake is disabled.
3. Remove the transmission covers.
4. Position the towing vehicle in place. Attach any chains needed to secure the disabled machine.



5. Attach a remote portable hydraulic pressurizing unit to the parking brake gauge port (5) on the secondary function manifold (6) mounted on the inside wall of the frame on the left side next to the transmission.
6. Turn the key switch to the ON position, release the park brake, and have an operator seated in the seat.
7. Pressurize the park brake with the pressurizing unit. Close the pump needle valve on the pressurizing unit.

CAUTION

DO NOT exceed 575 psi (40 bar) when pressurizing the park brake. Applying too much pressure may damage the brake seals.

8. Clear the area of all unnecessary personnel.
9. Remove the blocks from the wheels. Tow the machine to a secure location.
10. Remove the hydraulic pressurizing unit.

Note: *Without engine power, service brake power is reduced. Only the rear service brakes will function when the brake pedal is depressed. Steering is not possible and the machine will only travel in the direction that the wheels were last turned. Tow or push the machine at a very slow speed.*



Section 6

Transmission

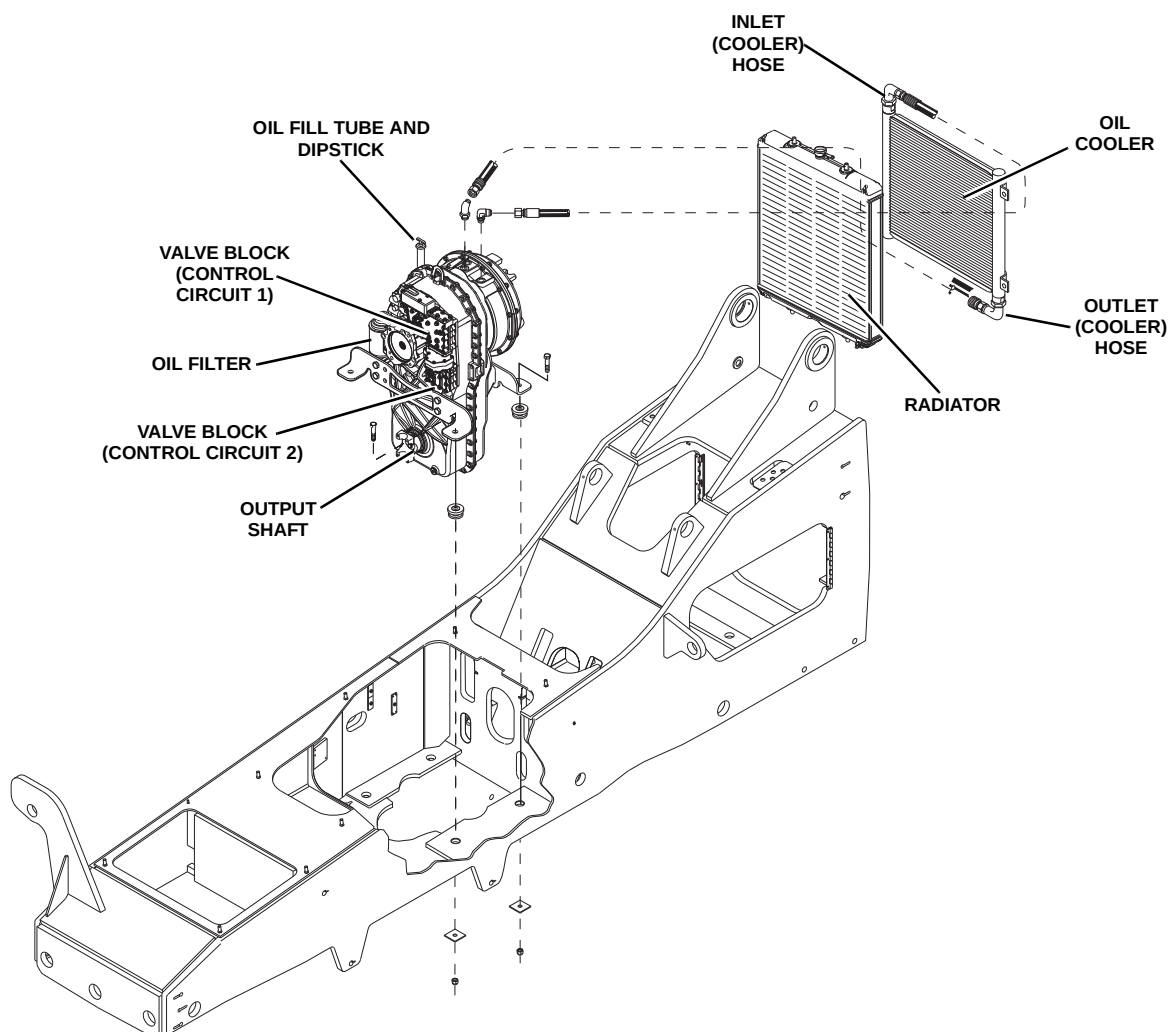
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6.1 TRANSMISSION ASSEMBLY COMPONENT TERMINOLOGY

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the transmission. The following illustration identifies the components that are referred to throughout this section.



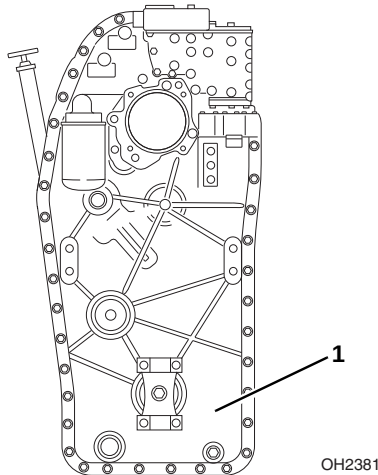
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⚠ WARNING

DO NOT service the machine without following all safety precautions as outlined in Section 1, "Safety Practices," of this manual.

6.2 TRANSMISSION SERIAL NUMBER



The transmission serial number plate (1) is located on the pump side (front) of the transmission at the bottom right toward the machine frame. Information on the serial number plate is required in correspondence regarding the transmission.

6.3 TRANSMISSION SPECIFICATIONS AND MAINTENANCE INFORMATION

For transmission, oil specifications and maintenance information, refer to Section 2, "General Information and Specifications."

Detailed transmission service instructions are provided in the following publications:

- Service Manual - P/N 8990455
- Parts Manual - 6036 P/N 8990417
 - 6042 P/N 8990467
 - 8042, 10042 & 10054 P/N 8990395

6.4 TRANSMISSION REPLACEMENT

Note: Contact your local JLG Service Department if internal transmission repair is required during the warranty period.

Note: Cleanliness is of extreme importance. Before attempting to remove the transmission, thoroughly clean the exterior of the transmission to help prevent dirt from

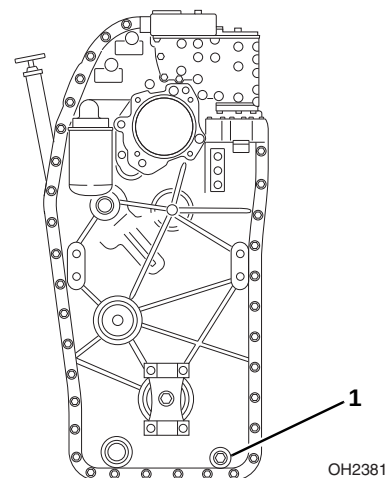
entering during the replacement process. Avoid spraying water or cleaning solution onto or near the transmission shift solenoids and other electrical components.

6.4.1 Transmission Removal

⚠ WARNING

NEVER lift a transmission alone; enlist the help of at least one assistant or use a suitable hoist or overhead crane and sling with the minimum lifting capacity of 1000 lb (454 kg).

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the boom.
4. Open the rear door. Allow the system fluids to cool.
5. Drain the hydraulic oil reservoir. Refer to Section 8.5.1, "Hydraulic Oil Reservoir Draining."
6. Properly disconnect the battery.
7. Remove the transmission covers.
8. Thoroughly clean the transmission and surrounding area, including all hoses and fittings, before proceeding.

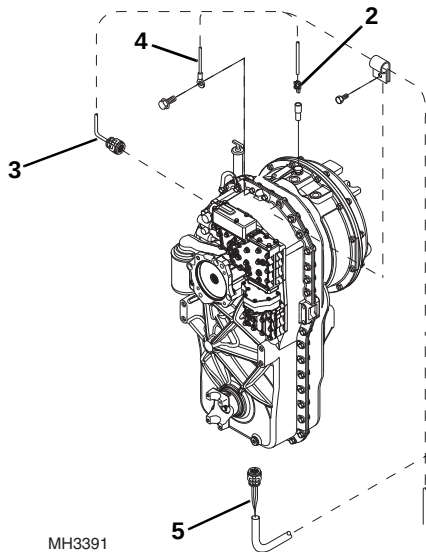


9. Place a suitable receptacle under the transmission drain plug (1). Remove the transmission drain plug, and allow the transmission oil to drain into the receptacle.

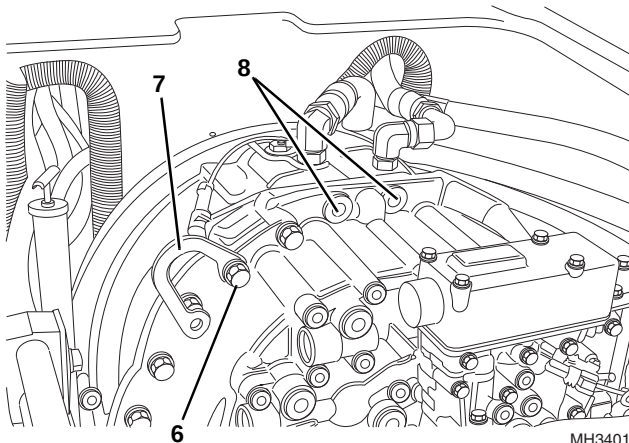


Transmission

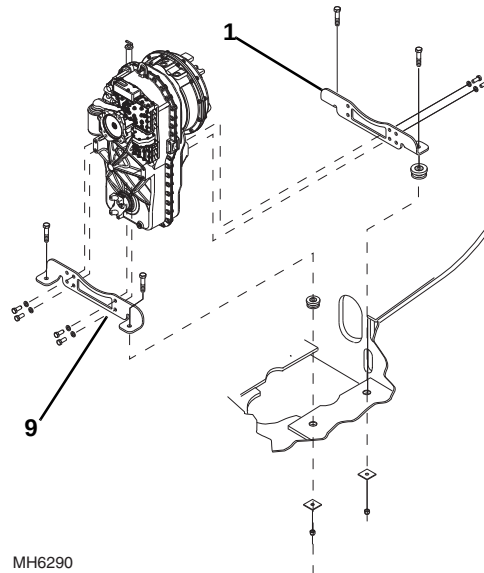
10. Transfer the used transmission oil into a suitable, covered container, and label the container as "Used Oil." Dispose of used oil at an approved recycling facility. Clean and reinstall the transmission drain plug.
11. Remove the engine-to- transmission and transmission-to-axle drive shafts. Refer to Section 5.6.3, "Drive Shaft Removal."
12. Remove the hydraulic pump. Refer to Section 8.6.1, "Pump Replacement."



13. Label and disconnect the transmission temperature switch connector (2) and shift solenoid wiring harness connectors (3).
14. Remove the capscrew securing the black wire (4) to the transmission housing, and disconnect the wire. DO NOT reinstall the capscrew at this time.
15. Remove the capscrew securing the clamp (5) and wiring harness to the transmission housing and move the wiring harness safely out of the way. DO NOT reinstall the capscrew at this time.



16. Remove the capscrew (6) securing the lifting ring (7) to the transmission housing. Once the lifting ring has been removed, reinstall the capscrew into the hole.
17. Move the lifting ring to the holes (8) used to secure the black wire and clamp. Secure the lifting ring using the capscrews and tighten securely.
18. Label, disconnect and cap the transmission oil cooler inlet and outlet hoses on the transmission.
19. Connect a lifting strap or chain to the lifting eye at the top of the transmission and to a suitable hoist or overhead crane. Operate the hoist or crane to remove slack from the chain, but DO NOT raise the transmission at this time.
20. Place blocks under the transmission to help support it during removal.



21. Remove the capscrews and lockwashers securing the front transmission mount (9) to the transmission.
22. Remove the two capscrews, hex locknuts and rebound washers. Remove the front transmission mount.
23. Remove the four capscrews and lockwashers securing the rear transmission mount (1) to the transmission.
24. Remove the two capscrews, hex locknuts and rebound washers. Remove the rear transmission mount.
25. Inspect the rubber mounts. Replace the mounts if damaged.
26. Carefully remove the transmission from the machine. Avoid causing damage to the transmission or surrounding parts.



27. Lift the transmission clear of the machine and lower it onto suitable supports or secure it to a stand built especially for the transmission or engine service. Secure the transmission so that it will not move or fall.
28. Remove any external transmission components as required, including the transmission temperature switch, and inlet and outlet cooler hose fittings. Cover all transmission openings.
29. Remove the transmission oil filter and dispose of properly. Clean the filter mounting surface. Cover or cap the oil filter mount.

6.4.2 Transmission Inspection and Internal Repair

If replacing the entire transmission, transfer the transmission temperature switch to the replacement transmission. The gear shift solenoids are included with a new transmission.

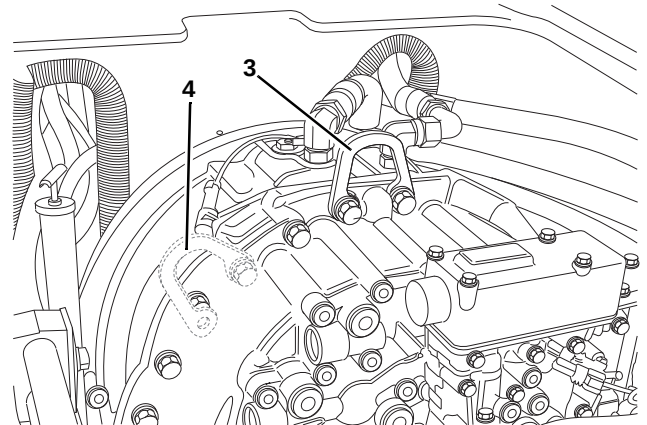
6.4.3 Transmission Installation



WARNING

NEVER lift a transmission alone; enlist the help of at least one assistant or use a suitable hoist or overhead crane and sling with the minimum lifting capacity of 1000 lb (454 kg).

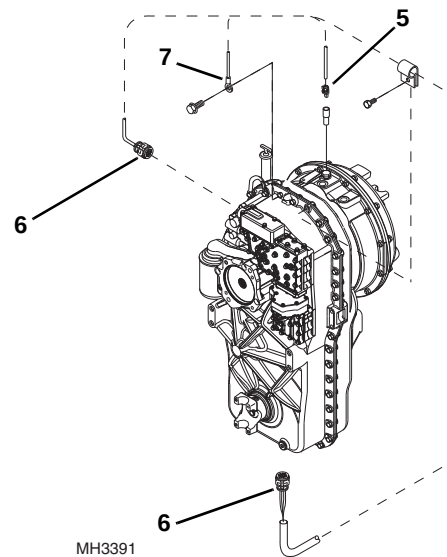
1. Install two rubber mounts and the rear transmission mount (1) in the machine frame. Secure the mount with the previously used hardware.
2. Use a hoist or overhead crane and sling attached to the lifting eye at the top of the transmission. Raise and position the transmission within the chassis.
3. Attach the transmission to the rear mounting bracket with the previously used hardware. Torque to 148 lb-ft (200 Nm).
4. Install the two front rubber mounts and the front transmission mounting bracket (9) on the transmission with the previously used hardware. Torque to 148 lb-ft (200 Nm)
5. Attach the front mounting bracket to the frame with the previously used hardware
6. Remove the hoist or overhead crane and sling.



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Note: The lifting ring (3) must be repositioned to allow the covers to be installed.

7. Remove the two capscrews securing the lifting ring to the transmission housing. Save the capscrews for later use.
8. Remove the capscrew and secure the lifting ring in the storage position (4) on the transmission housing as shown.



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9. Connect the transmission temperature switch connector (5) and shift solenoid wiring harness connectors (6).
10. Attach the black wire (7) to the transmission housing with a capscrew removed in step 7.
11. Secure the wiring harness to the transmission housing using the clip and a capscrew removed in step 7.



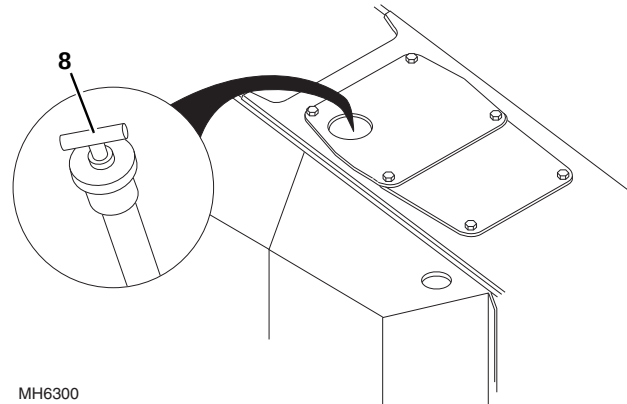
Transmission

12. Uncap and connect the previously labeled transmission oil cooler inlet and out hoses at the transmission.
13. Install the hydraulic pump. Refer to Section 8.6.1, "Pump Replacement."
14. Install the engine-to-transmission and transmission-to-axle drive shafts. Refer to Section 5.6.5, "Drive Shaft Installation."
15. Clean the transmission oil filter mounting surface.
16. Apply a thin film of clean Mobilfluid 424® (ISO Grade 46) to the new transmission filter gasket. Install the new filter and torque to 20-25 lb-ft (27-34 Nm).
17. Transmission oil may be added through the dipstick tube. Remove the dipstick and add Mobilfluid 424® (ISO Grade 46). Check the oil level by taking intermittent dipstick readings as outlined in the appropriate Operation & Safety Manual. DO NOT overfill. Reinstall the dipstick when finished.
18. Install the transmission covers.
19. Properly connect the battery.
20. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
21. Close and secure the rear door.

6.4.4 After Transmission Service or Replacement

In general:

1. Check the transmission oil level and add oil as required.
2. Install a new transmission filter.
3. Check the torque on the drive shaft yoke capscrews.
4. When an overhauled or repaired transmission is installed, thoroughly clean the oil cooler lines to and from the transmission.
5. Drain and flush the entire system.
6. Disconnect and clean all transmission cooler hoses. When possible, remove transmission lines from the machine for cleaning.
7. Thoroughly clean transmission filter screens and cases, and replace transmission filter elements.



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8. Reassemble all components and fill the transmission with clean, fresh Mobilfluid 424® (ISO Grade 46) through the dipstick tube opening (8). Check the level by taking intermittent dipstick readings as outlined in the appropriate Operation & Safety Manual. DO NOT overfill. Reinstall the dipstick when finished.
9. Run the engine for two minutes at idle to help prime the torque converter and the transmission oil lines.
10. Recheck the level of the fluid in the transmission with the engine running at idle.
11. Add Mobilfluid 424® (ISO Grade 46) as necessary to bring the fluid level up until it reaches the FULL mark on the dipstick. Recheck the oil level when it reaches operating temperature 180-200° F (83-94° C).
12. Recheck all drain plugs, lines, connections, etc., for leaks, and tighten where necessary.



6.5 TRANSMISSION TROUBLESHOOTING

This section provides an easy reference guide covering the most common problems that may occur during operation of the transmission.

Note: Contact the JLG Service Department if internal transmission repair is required during the warranty period.

The transmission should be checked, serviced and repaired only by experienced service technicians who are aware of all safety instructions and particular component features.

Problem	Cause	Remedy
1. Transmission will not engage or will not shift properly.	1. Oil level too high or low.	1. Fill transmission to correct level with Mobilfluid 424® ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Transmission control lever not functioning properly and/or a fault in the wiring harness. Transmission control lever not functioning properly and/or a fault in the wiring harness.	2. Refer to Section 9.5, "Electrical System Schematics."
	3. Transmission valve body solenoids not functioning properly.	3. Refer to Section 9.5, "Electrical System Schematics."
	4. Pilot-operated shift valves not operating properly.	4. Clean the valve spool and housing. Replace return spring as needed.
	5. Pump output pressure low.	5. Refer to Section 6.5, "Transmission Troubleshooting," Problem 2. "Low or no pump flow or pressure."
	6. Clutch piston o-rings damaged.	6. Replace o-rings.
	7. Clutch discs worn or damaged.	7. Replace clutch discs.
	8. Coupling shafts or gear teeth damaged.	8. Replace couplings.



Transmission

Problem	Cause	Remedy
2. Low or no pump flow or pressure.	1. Low oil level.	1. Fill transmission to correct level with Mobilfluid 424 [®] ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Transmission filled with incorrect oil, or oil contaminated.	2. Drain transmission and fill to correct level with Mobilfluid 424 [®] ISO Grade 46. Refer Section 2.4, "Fluid and Lubricant Capacities."
	3. Pump suction pipe screen clogged.	3. Clean, repair and/or replace suction pipe.
	4. Central shaft damaged.	4. Replace central shaft.
	5. Pump worn or damaged.	5. Repair or replace pump assembly.
3. Low clutch pressure.	1. Incorrect oil level.	1. Fill transmission to correct level with Mobilfluid 424 [®] ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Main pressure valve stuck open.	2. Clean the valve spool and housing.
	3. Broken or worn coupling shaft or piston o-rings.	3. Replace coupling and/or o-rings.
	4. Pressure reducing valve stuck open.	4. Clean the valve spool and housing.
4. Lack of power.	1. Park or service brake dragging.	1. Refer to Section 8.4, "Hydraulic Circuits."
	2. Low engine rpm causes converter stall.	2. Adjust the engine rpm to specifications. Refer to Transmission Service Manual.
	3. Pump output pressure is low.	3. Refer to Section 6.5, "Transmission Troubleshooting," Problem 2. "Low or no pump flow or pressure."
	4. Clutch discs worn or damaged.	4. Replace clutch discs.
	5. Transmission overheating.	5. Refer to Section 6.5, "Transmission Troubleshooting," Problem 5. "Transmission overheating (oil above 120° C (248° F))."



Problem	Cause	Remedy
5. Transmission overheating (oil above 120° C (248° F)).	1. Low oil level.	1. Fill transmission to correct level with Mobilfluid 424® ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Clogged radiator.	2. Remove debris from the radiator.
	3. Transmission filled with incorrect oil, or oil contaminated.	3. Drain transmission and fill to correct level with Mobilfluid 424® ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	4. Excessive "roading."	4. Stop and idle the engine.
	5. Restriction in oil cooler hoses.	5. Replace cooler hoses.
	6. Pump worn or damaged.	6. Repair or replace pump assembly.
	7. Engine thermostat stuck.	7. Replace engine thermostat.
6. Grinding or "clunking" noise from transmission.	1. Oil level too low.	1. Fill oil to correct level. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	2. Transmission filled with incorrect oil.	2. Drain transmission and fill to correct level with Mobilfluid 424® ISO Grade 46. Refer to Section 2.4, "Fluid and Lubricant Capacities."
	3. Incorrect clutch engagement.	3. Refer to Section 9.10.3, "Transmission Solenoid Valves."
	4. Internal damage.	4. Repair or replace parts as needed.
	5. Broken diaphragm (flex plate).	5. Replace diaphragm (flex plate). Refer to Section 6.4.1, "Transmission Removal."
	6. Loose diaphragm (flex plate) mounting capscrews.	6. Tighten capscrews.



Problem	Cause	Remedy
7. Oil leaking from transmission.	1. Oil leaking from vent (high oil level).	1. Remove drain plug and drain oil as needed, until oil is at correct level. Refer to Section 2.4, "Fluid and Lubricant Capacities." Replace o-rings as needed and tighten plugs to 96 lb-ft (130 Nm).
	2. Drain plug loose and/or o-rings damaged or missing.	2. Replace o-rings as needed and tighten plug to 26 lb-ft (35 Nm).
	3. Hose fittings loose.	3. Tighten fittings.
	4. Oil leaking at valve bodies (possible valve body gaskets damaged or missing and/or mounting capscrews not tight).	4. Replace gaskets and/or tighten capscrews to 7 lb-ft (9,5 Nm).
	5. Housing capscrews loose.	5. Tighten capscrews to 34 lb-ft (46 Nm).
	6. Oil leaking at pump (possible pump-to-housing o-rings missing or damaged, and/or pump mounting capscrews not tight).	6. Replace o-rings and/or tighten capscrews to 85 lb-ft (115 Nm).
	7. Oil leaking at converter bell (possible converter leak and/or input shaft seal damage).	7. Replace converter and/or input shaft seal.
	8. Oil leaking at output shaft (output shaft seal damaged).	8. Replace output shaft seal.
	9. Housing damaged.	9. Replace housing as needed.



Section 7

Engine - Cummins QSB3.3T/QSB4.5T

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7.1 INTRODUCTION

7.1.1 Disclaimer and Scope

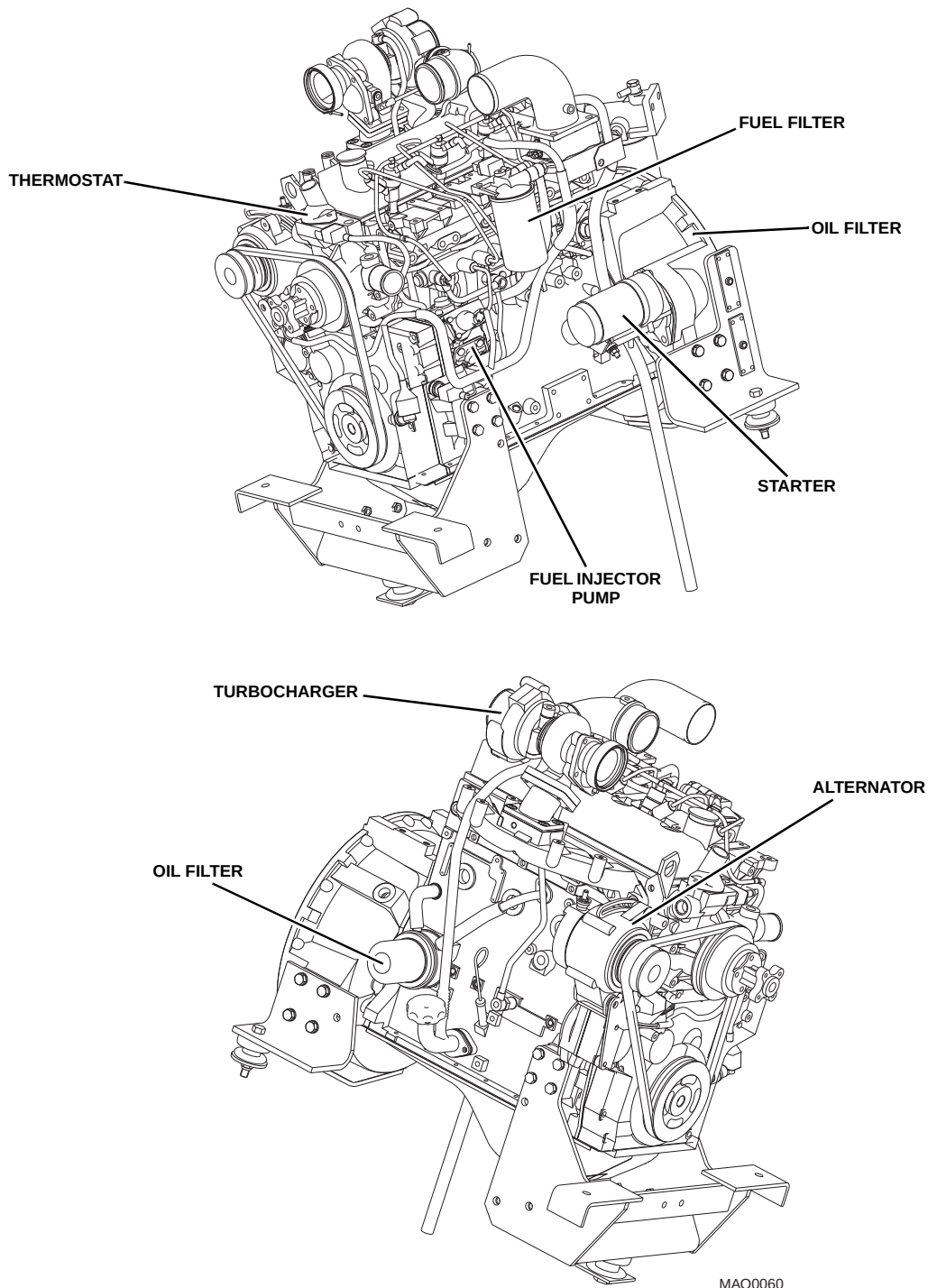
These instructions are written for worldwide use. In territories where legal requirements govern engine smoke emission, noise, safety factors, etc., apply all instructions, data and dimensions provided herein in such a way that after maintenance, service and repair of the engine, engine operation does not violate local regulations.

Note: *These instructions cover only the routine maintenance, removal, installation and troubleshooting of the engine. Refer to the local Cummins Engine Distributor and the applicable Cummins Engine Service Manual for assistance with comprehensive engine diagnosis, repair and component replacement. A gradual running-in (break-in) of a new engine is not necessary. Full load can be applied to a new engine as soon as the engine is put into service and the coolant temperature is at least 140° F (60° C). Extended light-load operation during the early life of the engine is not recommended. DO NOT run the engine at high, no-load speeds. DO NOT apply an overload to the engine.*



7.1.2 Component Terminology - Cummins - QSB3.3T/QSB4.5T

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the engine components. The following illustration identifies the components that are referred to throughout this section.



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7.2 ENGINE SERIAL NUMBER

The Cummins QSB3.3T/QSB4.5T serial number is stamped on a plate which is typically located on the engine rocker cover, but may be located on the side of the gear housing. Information contained in the serial number is required in correspondence with the engine manufacturer.

7.3 SPECIFICATIONS AND MAINTENANCE INFORMATION

For engine, coolant and oil specifications, and maintenance information, refer to Section 2, "General Information and Specifications."

Note: Detailed Cummins engine service instructions (covering disassembly, inspection, internal repair, assembly, adjustment and troubleshooting information) are provided in the appropriate Cummins engine service manual.

7.4 ENGINE COOLING SYSTEM

7.4.1 Radiator Pressure Cap

For a 210° F (99° C) system, use a 13 psi (90 kPa) radiator cap. An incorrect or malfunctioning cap can result in the loss of coolant and a hot-running engine.

7.4.2 Radiator/Oil Cooler and Replacement

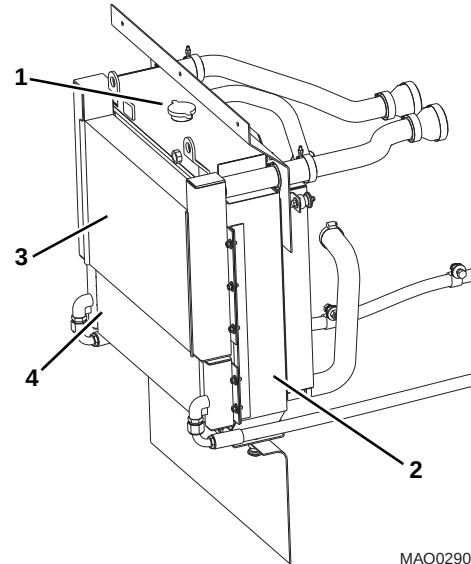
Before considering radiator or oil cooler replacement for other than obvious damage, conduct a cooling system pressure test check the coolant specific gravity, coolant level, fan belt tension and dash panel temperature indicator.

- If the engine runs hot, check the temperature of the upper radiator hose.
- If the hose is not hot, the thermostat may be stuck in the closed position.
- If the engine has overheated, performance may suffer, indicating other damage including a leaking cylinder head gasket, cracked cylinder head or block, and/or other internal engine damage.

a. Radiator/Oil Cooler Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.

2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the side and rear engine doors. Allow the system fluids to cool.
4. Disconnect the battery positive (+) and negative (-) cables from the appropriate battery terminals. Remove the battery or batteries.



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5. Slowly turn the radiator cap (1) to the first stop and allow any pressure to escape. Remove the radiator cap.
6. Place a suitable container beneath the radiator drain.
7. Place a funnel at the base of the radiator to channel the drained coolant into a container. Loosen the drain petcock and slowly allow the coolant to drain. Transfer the coolant into a properly labeled container. Dispose of properly if coolant needs to be replaced. Tighten the radiator drain petcock.
8. Label and disconnect all hoses and tubes attached to the radiator (2), charge air cooler (3) and oil cooler (4).
9. Working at the rear of the machine, remove the capscrews and lockwashers securing the radiator assembly.
10. Remove the radiator assembly through the rear of the machine.

b. Radiator/Oil Cooler Installation

1. Secure the radiator (2), charge air cooler (3) and oil cooler (4) to the machine frame with the previously used hardware.



2. Uncap and connect the all the previously labeled hoses and tubes to their appropriate locations.
3. Install the battery or batteries. Connect the battery positive (+) and negative (-) cables to the appropriate battery terminals.
4. Open the radiator cap (1) and fill the radiator completely with coolant. Replace and tighten the radiator cap. Refer to Section 2.4, "Fluid and Lubricant Capacities," for proper capacities.
5. Run the engine to operating temperature. Visually check for leaks with the engine running. Check the coolant level in the overflow bottle and fill, or drain, as necessary.
6. Close and secure the side and rear engine doors.

7.5 ENGINE ELECTRICAL SYSTEM

The engine electrical system, including the starter, alternator and primary wiring, is described in Section 9, "Electrical System."

7.6 FUEL SYSTEM

7.6.1 Diesel Fuel

Fuel represents a major portion of machine operating costs and therefore must be used efficiently. ALWAYS use a premium brand of high-quality, clean diesel fuel. Low cost, inferior fuel can lead to poor performance and expensive engine repair.

Note: Use only diesel fuel designed for diesel engines. Some heating fuels contain harmful chemicals that can seriously affect engine efficiency and performance.

Note: Due to the precise tolerances of diesel injection systems, keep the fuel clean, and free of dirt and water. Dirt and water in the fuel system can cause severe damage to both the injection pump and the injection nozzles. Use ASTM #2 diesel fuel with a minimum Cetane rating of 40. #2 diesel fuel gives the best economy and performance under most operating conditions. Fuels with Cetane numbers higher than 40 may be needed in high altitudes or extremely low ambient temperatures to help prevent misfiring and excessive smoking.

Inform the owner/operator of the machine to use #2 diesel fuel, unless ambient temperatures are below 32° F (0° C). When temperatures are below 32° F (0° C), a blend of #1 diesel and #2 diesel fuels (known as "winterized" #2 diesel) may be used.

Note: #1 diesel fuel may be used, however, fuel economy will be reduced.

Use a low-sulfur content fuel with a cloud point (the temperature at which wax crystals form in diesel fuel) at least 10° below the lowest expected fuel temperature. The viscosity of the fuel must be kept above 1.3 centistrokes to provide adequate fuel system lubrication.

7.6.2 Fuel/Hydraulic Oil Tank

Note: The fuel/hydraulic oil tank is part of a one piece unit divided into a two compartment (tank) unit. It is located on the right side of the machine, across from the operator cab. If it is determined that either the fuel or hydraulic oil tank must be removed, both the fuel and hydraulic oil must be drained before tank removal. Always dispose of hydraulic oil or fuel properly.

a. Fuel/Hydraulic Oil Tank Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.

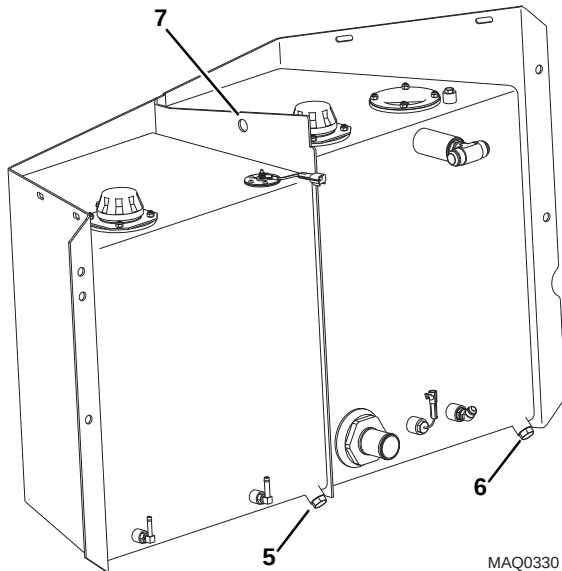
Note: If replacing the tank, remove all internal and external components from the old tank, and retain for use on the replacement tank.

Note: Have a dry chemical (Class B) fire extinguisher near the work area.

WARNING

NEVER drain or store fuel in an open container due to the possibility of explosion or fire. Discard the fuel in an approved manner.

5. Remove the fuel/hydraulic oil tank top cover.
6. Remove the two frame top covers from above the frame.



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7. Remove fuel tank drain plug (5), and drain fuel into an approved and suitable container. Dispose of fuel properly.
8. Drain the hydraulic oil tank (6). Refer to Section 8.5.1, "Hydraulic Oil Reservoir Draining."
9. Label, disconnect and cap the fuel and hydraulic lines from the tank.
10. Label and disconnect the electrical components from the fuel/hydraulic oil tank.
11. Position and connect a suitable chain support to tank lifting point (7) and take up slack in the chain.
12. While supporting the tank, remove nuts and lockwashers securing the tank to the machine frame. Pull tank away from the tank carriage bolts, and remove tank.

b. Disassembly

The fuel/hydraulic oil tank is a one-piece unit and cannot be disassembled. The fuel level indicator and hydraulic filters can be removed and reused on the new replacement tank. Dispose of the old tank according to local regulations concerning hazardous materials disposal.

c. Cleaning and Drying

If contaminated fuel or foreign material is in the tank, the tank can usually be cleaned.

Note: If a leak is suspected in the fuel tank, contact your local authorized Service Department.

To clean the fuel tank:

1. Have a dry chemical (Class B) fire extinguisher near the work area.
2. Depending on which side of the tank is contaminated (fuel or hydraulic oil), remove the fuel or oil tank drain plug, and safely drain any fuel or hydraulic oil into a suitable container. Dispose of fuel or hydraulic oil properly.
3. Clean the fuel/hydraulic oil tank with a high pressure washer, or flush the tank with hot water for five minutes and drain the water. Dispose of contaminated water properly.
4. For the fuel tank side, add a diesel fuel emulsifying agent to the tank. Refer to manufacturer's instructions for the correct emulsifying agent-to-water mixture ratio. Refill the tank with water, and agitate mixture for 10 minutes. Drain the tank completely. Dispose of contaminated water properly.
5. Refill the fuel tank with water until it overflows. Completely flush the tank with water. Empty the fuel tank, and allow it to dry completely.

d. Assembly

The fuel/hydraulic oil tank is a one piece-unit and cannot be disassembled. The fuel level indicator and hydraulic filters can be removed and reused on the new replacement tank. Dispose of the old tank according to local regulations concerning hazardous materials disposal regulations.

e. Inspection

Note: If a leak is suspected in the fuel tank, contact your local authorized Service Department.

1. Inspect the tank thoroughly for any cracks, slices, leaks or other damage.
2. With the tank removed from the machine, plug all openings except one elbow fitting. Install the elbow fitting, and apply approximately 1-1.5 psi (7-10 kPa) of air pressure through the elbow. Check the reservoir for leaks by applying a soap solution to the exterior and look for bubbles to appear at the cracked or damaged area.



f. Fuel/Hydraulic Oil Tank Installation

1. Attach the tank to a suitable lifting device at the lift point.
2. Place the tank carriage bolts into the slotted holes in the frame.
3. Position the tank and insert carriage bolts through tank attachment holes. Install lockwashers and finger tighten nuts onto carriage bolts. Slide the tank and carriage bolts toward the front of machine, until carriage bolts are bottomed out into the slotted frame holes.
4. Connect the previously labeled electrical components to the tank.
5. Uncap and connect the previously labeled hydraulic hoses to their appropriate locations.
6. Fill the tank according to specifications. Refer to Section 2.4, "Fluid and Lubricant Capacities."
7. Check tank for leaks.
8. Install the two frame top covers.
9. Install the fuel/hydraulic oil tank cover.
10. Properly connect the battery.
11. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
12. Close and secure the rear door.

7.6.3 After Fuel System Service

1. Drain and flush the fuel tank if it was contaminated.
2. Vent air from the fuel system in accordance with the instructions found in the appropriate Operator & Safety Manual.
3. Fill the fuel tank with fresh, clean diesel fuel as required.

7.7 ENGINE EXHAUST SYSTEM

Rattles and noise vibrations in the exhaust system are usually caused by misalignment or parts. When aligning the system, leave all capscrews and nuts slightly loose until all parts are properly aligned, then tighten all fasteners working from the front of the system to the rear.

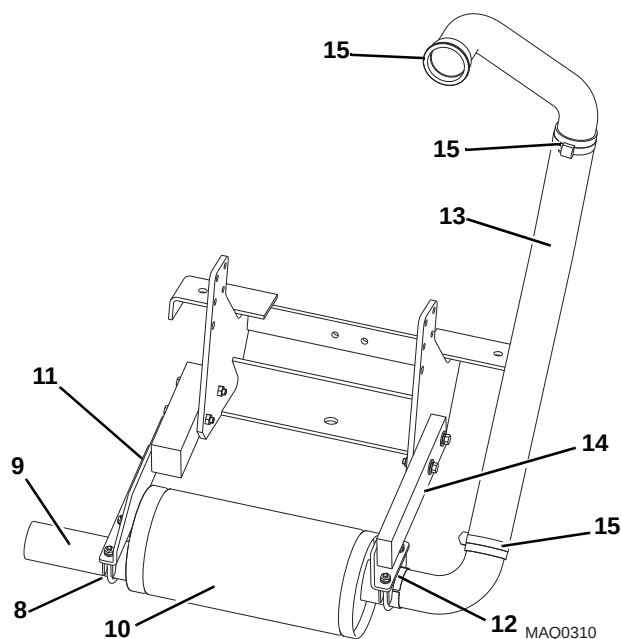
When replacing the muffler, also replace the tail pipe.

Before assembling components, use exhaust system sealer at all slip joint connections.

When installing exhaust system components, allow sufficient clearance between the components and other pipes, hoses and wiring that could be adversely affected by excessive heat.

7.7.1 Exhaust System Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. Loosen the clamp (8) supporting the tail pipe (9) and muffler (10) from the muffler mounting bracket (11).
6. Loosen the clamp (12) supporting the exhaust pipe (13) and muffler (10) from the muffler mounting bracket (14).
7. Loosen the three clamps (15) on the exhaust pipe (13).
8. Remove the clamps (8 & 12) attaching the muffler (10) to the muffler mounting brackets (11 & 14).
9. Remove the muffler (10) and if needed, the exhaust pipe (13).

7.7.2 Exhaust System Installation

Note: Install muffler in proper direction.

Note: Keep all clamps loosened until entire exhaust system is in place.

1. Using clamps (8 & 12), install the muffler (10) to the muffler mounting brackets (11 & 14).



2. If previously removed, install the exhaust pipe (13).
3. Install the exhaust pipe (13) into the muffler (10).
4. Install the tail pipe (9) into the muffler (10).
5. Tighten all clamps (8 & 15).
6. Properly connect the battery.
7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
8. Start engine and check for exhaust leaks at all exhaust connections. Adjust or repair as needed.
9. Close and secure the rear door.

7.8 AIR CLEANER ASSEMBLY

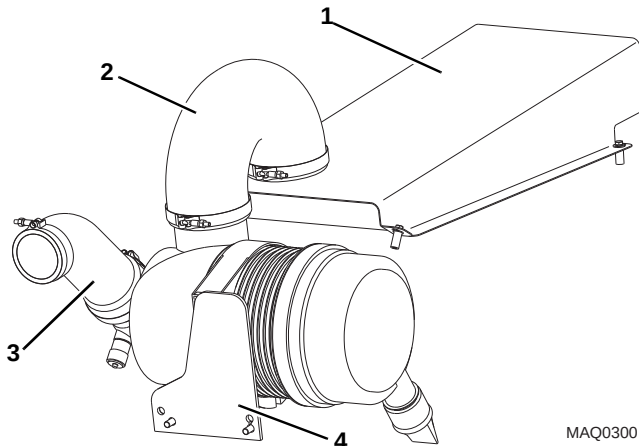


NEVER run the engine with only the inner safety element installed.

Note: Refer to the appropriate Operation & Safety Manual for your machine for the correct element change procedure.

7.8.1 Air Cleaner Assembly Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



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5. Remove the clamp securing the air scoop (1) to the air cleaner inlet tube (2).
6. Remove the clamps securing the hose (3) to the air cleaner assembly.
7. Remove the capscrews and lockwashers securing the band (4) to the air cleaner bracket. Remove the air cleaner assembly.

7.8.2 Air Cleaner Assembly Installation

Note: Apply Loctite® 242™ threadlock to the capscrew threads before installation.

1. Secure the band (4) to the air cleaner bracket with the previously used hardware.
2. Install the air cleaner assembly.
3. Install the clamps to secure the hose (3) to the air cleaner assembly.
4. Install the clamp to secure the air cleaner inlet tube (2) to the air scoop (1).
5. Tighten all clamps.
6. Properly connect the battery.
7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
8. Close and secure the rear door.



7.9 ENGINE REPLACEMENT

7.9.1 Engine Removal

Note: The radiator and oil cooler must be removed from the machine before engine removal. Refer to Section 7.4, "Engine Cooling System." Several additional components must be removed before engine removal. They will be addressed in the following procedures.

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the rear door and engine side covers.
6. Drain and remove the radiator assembly. Refer to Section 7.4.2, "Radiator/Oil Cooler and Replacement."
7. Remove the radiator overflow tube, overflow tank and hose support.
8. Label, disconnect and cap the heater hoses attached to the engine (if equipped).

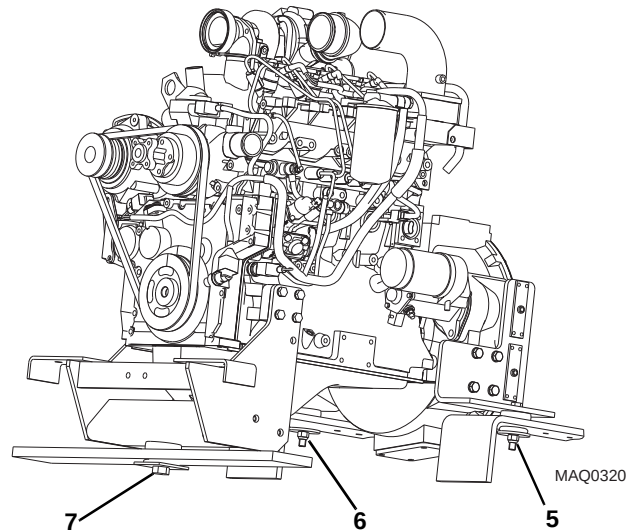
Note: The engine harness is routed and attached to the engine using hold-down clamps and plastic wire ties at various places on the engine. Before removing engine, ensure that the harness has been completely separated (disconnected) from the engine. Move the harness clear of the engine, and with the help of an observer, ensure that the engine clears the harness during removal.

9. Label and disconnect all electrical wire connections on the engine.
10. Label, disconnect and cap the fuel inlet line at the fuel lift pump.
11. Label, disconnect and cap the fuel return line from the injector pump.
12. Remove the engine-to-transmission drive shaft. Refer to Section 5.6.3, "Drive Shaft Removal."

Note: Before the engine can be removed from the machine, the air conditioning hoses need to be removed from the air conditioning compressor. This procedure must be completed by an authorized air conditioning service technician. This service technician will also need to be available when the new engine is installed to re-

install the air conditioning hoses and to the air conditioning compressor.

13. Loosen the clamps on the sleeve reducer at the engine and on the air suction pipe.
14. Remove the air cleaner assembly. Refer to Section 7.8.1, "Air Cleaner Assembly Removal."
15. Remove the exhaust pipe from the exhaust manifold. Refer to Section 7.7.1, "Exhaust System Removal."



16. At the front right engine mount (5), remove the hardware securing the mount to the frame. Repeat procedure for left engine mount (6).
17. Remove the hardware securing the rear engine mount (7).
18. Remove the exhaust pipe bracket.
19. Position a fork truck behind the machine, and drive forward, placing the forks underneath the rear engine mount and front engine mount brackets. Slightly lift the engine, and slowly back engine out of the machine. Have an assistant ensure that the engine clears all frame components during removal.
20. Place engine on a flat, level surface.
21. If replacing engine, attach a lifting chain to the front and rear engine lift brackets, and lift engine clear of the ground.
22. Remove the three engine mounting brackets.

7.9.2 Engine Installation

Note: The engine harness is routed and attached at various places on the engine using hold-down clamps and plastic wire ties. Before installing engine and with



Engine - Cummins QSB3.3T/QSB4.5T

the help of an assistant, ensure that the engine clears the harness during installation.

1. If replacing the engine, attach a lifting strap or chain to the front and rear engine lift brackets, and lift the engine clear of the ground.
2. Install the engine mounting brackets. Torque to 93-100 lb-ft (126-135 Nm).
3. Place the engine on a flat, level surface.
4. Position a fork truck behind the engine, and drive forward, placing the forks underneath the rear engine mount and front right and left engine mount brackets. Lift the engine and slowly drive it into the back of the machine. Have an assistant ensure that the engine clears all frame, hose and harness components during installation. Position the engine brackets over rear and front frame mounts.
5. Secure the rear engine mount (5) to the frame using the previously used hardware. Torque to 80-90 lb-ft (108-122 Nm).
6. Secure the front left (4) and right (3) engine mounts to the frame using the previously used hardware. Torque to 80-90 lb-ft (108-122 Nm).
7. Install the exhaust pipe mount bracket.
8. Install the radiator overflow tube, overflow tank and hose support.
9. Install the engine-to-transmission drive shaft. Refer to Section 5.6.5, "Drive Shaft Installation."
10. Uncap and connect the previously labeled fuel return line to the injector pump.
11. Uncap and connect the previously labeled fuel inlet line to the fuel lift pump.
12. Connect the previously labeled electrical wire connections on the engine.
13. Uncap and connect the previously labeled heater hoses to the engine (if equipped).
14. Install the complete radiator assembly. Refer to Section 7.4.2, "Radiator/Oil Cooler and Replacement."
15. Properly connect the battery.
16. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
17. Check that all hydraulic system, electrical system, cooling system, fuel system and exhaust system connections are correct and connected tightly.

Note: Have an assistant stand by with a Class B fire extinguisher.

18. Start the engine and run to normal operating temperature then shut off the engine. While the engine is cooling, check for leaks.
19. Allow the engine to cool. Check the radiator coolant level, and add coolant if needed. Replace the radiator cap.
20. Check for leaks from the engine, main hydraulic pump and lines, transmission, hydraulic reservoir and fuel tank. Check the levels of all fluids and lubricants. Fill as required.

Note: During the full throttle check:

- DO NOT operate any hydraulic function.
 - DO NOT steer or apply any pressure to the steering wheel.
 - Keep the transmission in (N) NEUTRAL.
21. Obtain and connect an appropriate engine analyzer or tachometer. Check the engine rpm at full throttle.
 22. Purge the hydraulic system of air by operating all boom functions through their entire range of motion several times. Check the hydraulic oil level.
 23. Check for proper operation of all components.
 24. Turn the engine OFF.
 25. Install the side and rear engine covers.

7.10 ISOLATION COUPLER

7.10.1 Isolation Coupler Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the travel select lever in the (N) NEUTRAL position, engage the parking brake, and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.

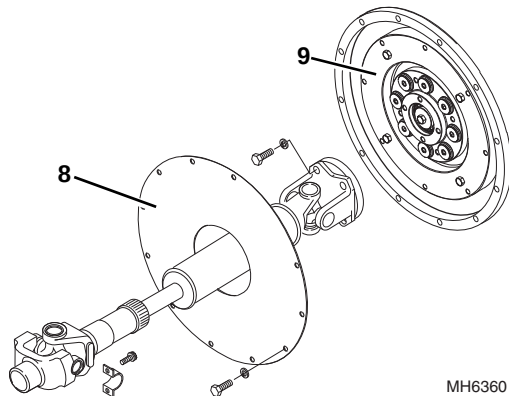
Note: Rotating the fan belt by hand gives greater access to removing the drive shaft mounting capscrews.

5. Remove the capscrews and straps that secure the drive shaft to the transmission yoke.
6. Remove the capscrews and lockwashers securing the drive shaft to the coupling flange.

Note: It may be necessary to loosen/remove the motor mounts on either side of the engine to gain access to the bottom capscrews on the outer half of the coupler. Place



a jack under the bell housing (use a wood block to support the engine) and carefully lift the engine until the bottom edge of the bell housing is at the top edge of the frame member that mounts the rear axle to the frame. Watch the fan-to-radiator clearance as you are lifting the engine. If necessary, turn the fan slightly by hand to gain additional clearance.



7. Remove the capscrews and lockwashers securing the outer half of the coupler (8).
8. Remove the capscrews securing the small access cover.
9. Remove the capscrews and locknuts securing the coupler (9) to the flywheel. Turn the engine by hand, using the fan belt, until the capscrews line up with the access hole.
10. At this time, use a suitable cleaner/solvent and thoroughly clean the mounting lip of the flywheel. Wipe any debris from the inside of the bell housing. Use the cleaner to clean the threaded holes around the flange of the bell housing.

7.10.2 Isolation Coupler Installation

1. Use cleaner to clean the backside of the coupler, where it comes in contact with the flywheel.

Note: The new coupler is heavy and requires two people, one on each side, to install.

2. Place the new coupler into the indentation of the flywheel and use new hardware to secure the coupler to the flywheel.
3. Insert one capscrew into the access hole on the rear right side of the bell housing and through the flywheel and coupler. Assemble a new locknut onto the capscrew. DO NOT fully tighten at this time.
4. Turn the flywheel 180° and insert another capscrew and assemble with another new locknut. DO NOT fully tighten until all capscrews and locknuts are in place.

5. After all capscrews are in place, check to be sure the coupler is resting squarely in the indentation of the flywheel. Torque all the capscrews to 37 lb-ft (48 Nm).
6. Install the small access cover plate to the right side of the engine and tighten the hardware securely.

Note: Before assembling the drive shaft to the coupling; be sure the access cover plate is placed on the engine-side of the frame member that mounts the rear axle to the frame.

Note: Apply Loctite® 242™ threadlock compound to all of the capscrews used during assembly.

7. Install the access cover plate over the drive shaft and assemble the drive shaft flange to the coupler using new hardware. Torque to 48 lb-ft (65 Nm).
8. If engine mounts were previously removed or loosened, carefully lower the engine down onto the front engine mounts. Reassemble the rebound washer and secure in place with a new locknut. Torque to 60 lb-ft (81 Nm). Repeat this procedure for the engine mount on the other side.
9. Thoroughly clean the transmission yoke and secure in place with new straps and hardware. Torque to 55-60 lb-ft (75-81 Nm).
10. After the drive shaft is in place, grease both u-joints and the slip joint using multi-purpose grease.
11. Properly connect the battery.
12. Close and secure the rear door.
13. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.



7.11 TROUBLESHOOTING

Trouble	Possible Causes (see key, below)
Low Cranking Power	1, 2, 3, 4
Will Not Start	5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 31, 32, 33
Difficult Starting	5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 29, 31, 32, 33, 61, 63
Lack of Power	8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 61, 63
Misfiring	8, 9, 10, 12, 13, 14, 16, 18, 19, 20, 25, 26, 28, 29, 30, 32
Excessive Fuel Consumption	11, 13, 14, 16, 18, 19, 20, 22, 23, 24, 25, 27, 28, 29, 31, 32, 33, 63
Black Exhaust	11, 13, 14, 16, 18, 19, 20, 22, 24, 25, 27, 28, 29, 31, 32, 33, 61, 63
Blue/White Exhaust	4, 16, 18, 19, 20, 25, 27, 31, 33, 34, 35, 45, 56, 62
Low Oil Pressure	4, 36, 37, 38, 39, 40, 42, 43, 44, 58
Knocking	9, 14, 16, 18, 19, 22, 26, 28, 29, 31, 33, 35, 36, 45, 46, 59
Erratic Running	7, 8, 9, 10, 11, 12, 13, 14, 16, 20, 21, 23, 26, 28, 29, 30, 33, 35, 45, 59
Vibration	13, 14, 20, 23, 25, 26, 29, 30, 33, 45, 47, 48, 49
High Oil Pressure	4, 38, 41
Overheating	11, 13, 14, 16, 18, 19, 24, 25, 45, 50, 51, 52, 53, 54, 57
Excessive Crankcase Pressure	25, 31, 33, 34, 45, 55, 60
Poor Compression	11, 19, 25, 28, 29, 31, 32, 33, 34, 46, 59
Starts and Stops	10, 11, 12

Key to Possible Causes

- | | | |
|--|---|--|
| 1. Battery charge low | 21. Blocked fuel tank vent | 43. Faulty suction pipe |
| 2. Bad electrical connection | 22. Incorrect grade of fuel | 44. Restricted oil filter |
| 3. Faulty starter motor | 23. Sticking throttle or
restricted movement | 45. Piston seizure/pick up |
| 4. Incorrect grade of
lubricating oil | 24. Exhaust pipe restriction | 46. Incorrect piston height |
| 5. Low cranking speed | 25. Leaking cylinder head gasket | 47. Damaged fan |
| 6. Fuel tank empty | 26. Overheating | 48. Faulty engine mounting |
| 7. Faulty stop control operation | 27. Cold running | 49. Incorrectly aligned flywheel
housing or incorrectly aligned
flywheel |
| 8. Fuel inlet restricted | 28. Incorrect tappet adjustment | 50. Faulty thermostat |
| 9. Faulty fuel lift pump | 29. Sticking valves | 51. Restriction in water jacket |
| 10. Clogged fuel filter | 30. Incorrect high pressure pipes | 52. Loose fan belt |
| 11. Restricted air cleaner | 31. Worn cylinder bores | 53. Restricted radiator |
| 12. Air in fuel system | 32. Pitted valves and seats | 54. Faulty water pump |
| 13. Faulty fuel injection pump | 33. Broken, worn or sticking
piston ring(s) | 55. Restricted breather pipe |
| 14. Faulty fuel injectors or
incorrect type | 34. Worn valve stems and guides | 56. Damaged valve stem oil
deflectors (if fitted) |
| 15. Incorrect use of cold start
equipment | 35. Restricted air cleaner | 57. Coolant level too low |
| 16. Faulty cold start equipment | 36. Worn or damaged bearings | 58. Blocked sump strainer |
| 17. Broken fuel injection
pump drive | 37. Insufficient oil in sump | 59. Broken valve spring |
| 18. Incorrect fuel pump timing | 38. Inaccurate gauge | 60. Exhauster or vacuum pipe leak |
| 19. Incorrect valve timing | 39. Oil pump worn | 61. Turbo impeller damaged or dirty |
| 20. Poor compression | 40. Pressure relief valve sticking open | 62. Turbo lubricating oil seal leak |
| | 41. Pressure relief valve sticking closed | 63. Induction system leaks |
| | 42. Broken relief valve spring | |



Section 8

Hydraulic System

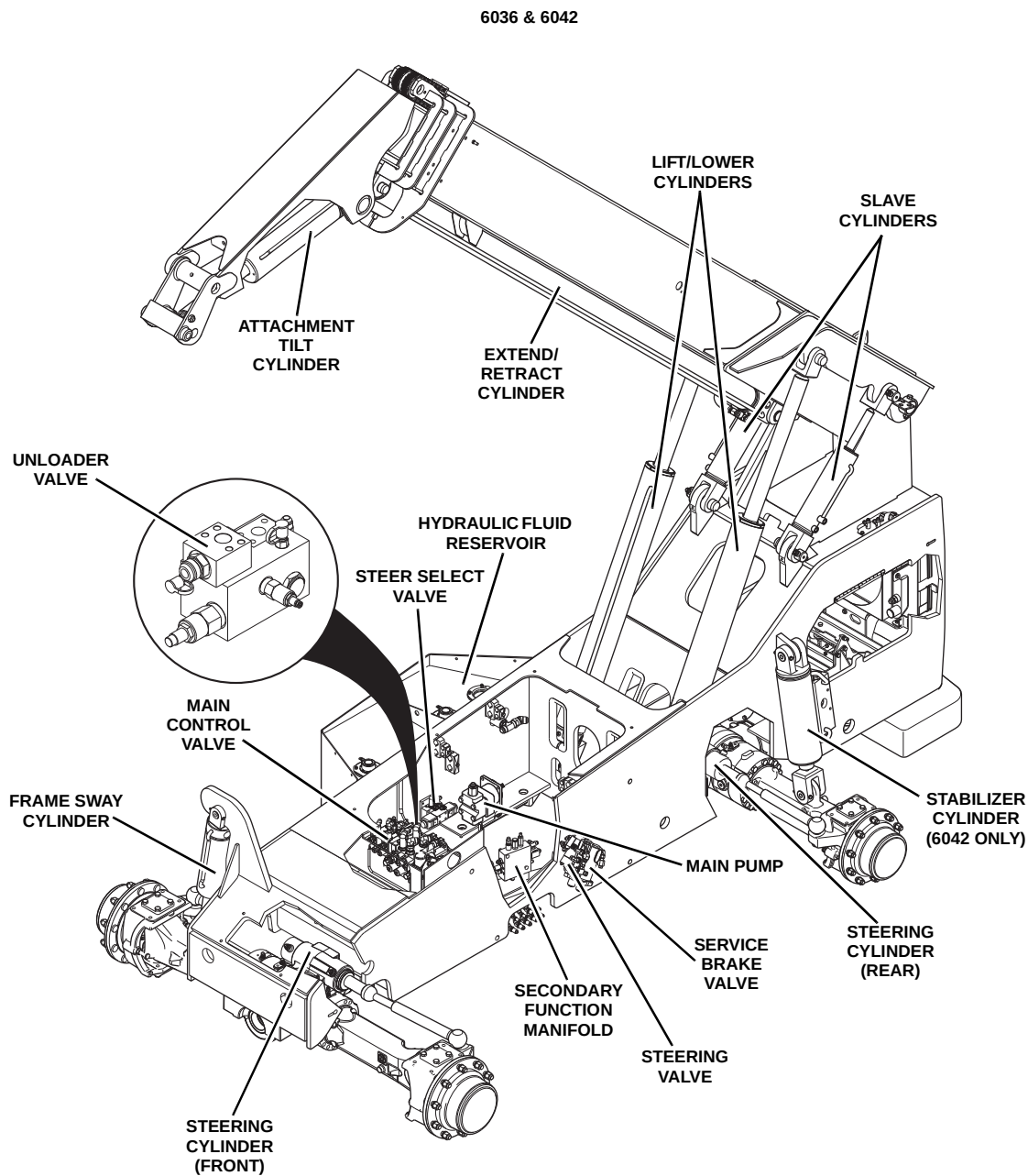
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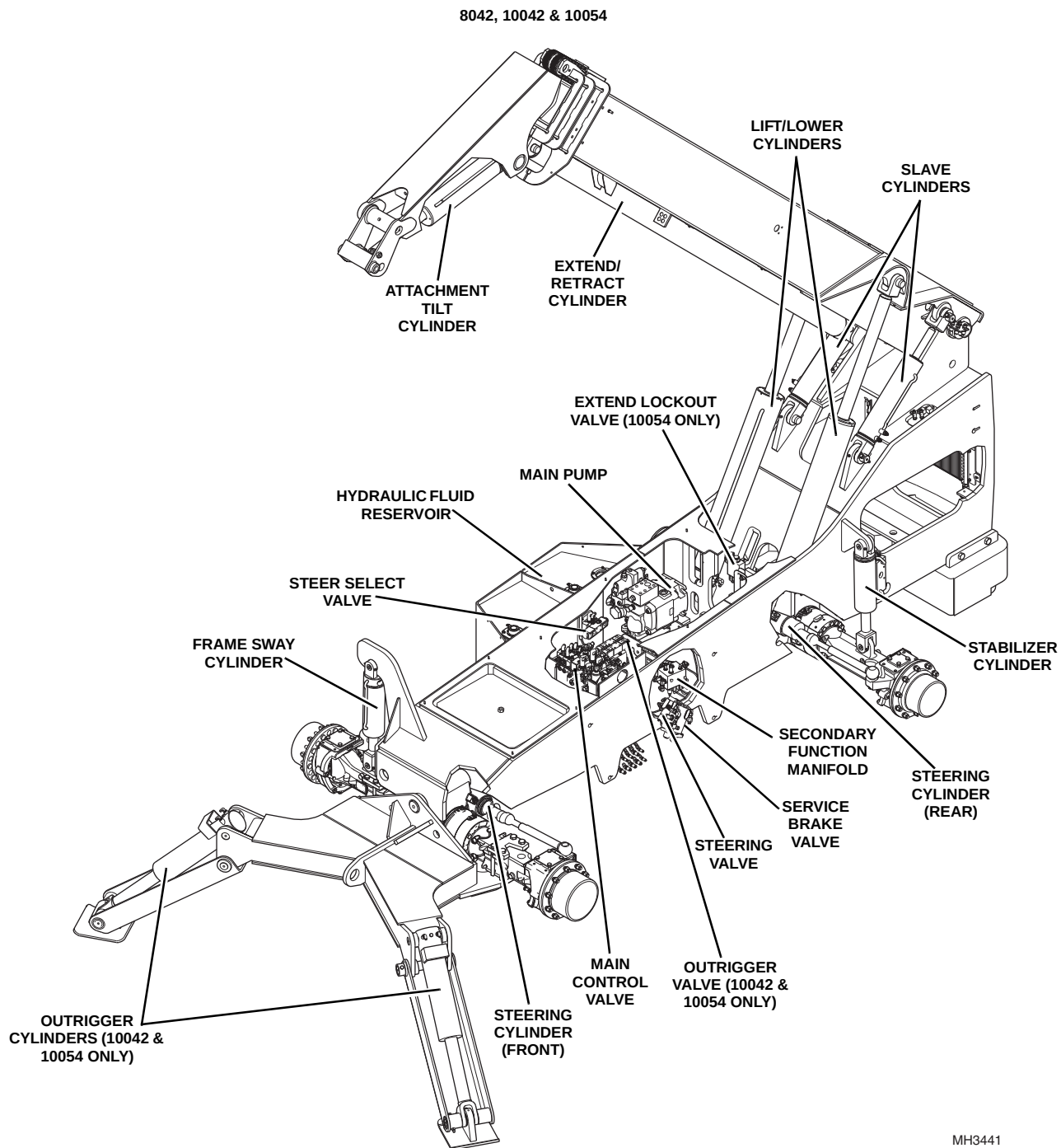


8.1 HYDRAULIC COMPONENT TERMINOLOGY

To understand the safety, operation and service information presented in this section, it is necessary that the operator/mechanic be familiar with the name and location of the hydraulic components of the machine. The following illustration identifies the components that are referred to throughout this section.



MA9251





Hydraulic System

8.2 SAFETY INFORMATION

WARNING

DO NOT service the machine without following all safety precautions as outlined in Section 1, "Safety Practices," of this manual.

Petroleum-based hydraulic fluids are used in this machine. The temperature of hydraulic fluid increases during the operation of various hydraulic functions. A heated petroleum-based hydraulic fluid presents a fire hazard, especially when an ignition source is present. Hydraulic fluid has a flash point that ranges from 300-600° F (150-318° C) and an auto-ignition temperature of 500-750° F (262-402° C).

Accordingly, periodically inspect all hydraulic system components, hoses, tubes, lines, fittings, etc. Carefully examine any deterioration and determine whether any further use of the component would constitute a hazard. If in doubt, replace the component.

Operate the hydraulic controls after the engine has stopped to relieve trapped pressure.

Note: Residual pressure may remain in hydraulic cylinders, hoses, valve bodies, components, etc. If the hydraulic lines going to or coming from a component are taut, slowly and cautiously relieve ("bleed off") pressure. Whenever you disconnect a hydraulic line, coupler, fitting or other component, slowly and cautiously loosen the part involved. A hissing sound or slow seepage of hydraulic fluid may occur in most cases. After the hissing sound has ceased, continue removing the part. Any escaping oil should be directed into an appropriate container. Cap or otherwise block off the part to prevent further fluid seepage.

Hydraulic system maintenance will, at times, require that the engine be operated. Always follow safety precautions.

A major cause of hydraulic component failure is contamination. Keeping the hydraulic fluid as clean as possible will help avoid downtime and repairs. Sand, grit and other contaminants can damage the finely machined surfaces within hydraulic components. If operating in an exceptionally dirty environment, change filters and inspect the fluid more often. When servicing the system, cap or plug hydraulic fittings, hoses and tube assemblies. Plug all cylinder ports, valves and the hydraulic reservoir, and pump openings until installation occurs. Protect threads from contamination and damage.

Some hydraulic functions are actuated by interfacing with electrical system components (switches, solenoids and sensors). When the hydraulic system is not functioning properly, check the electrical aspect of the malfunctioning circuit also.

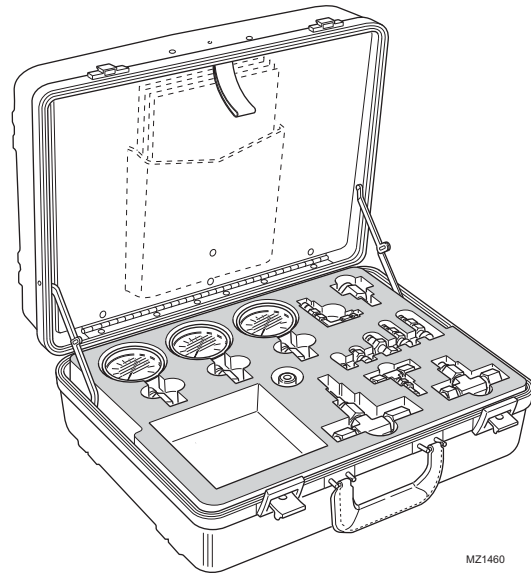
8.3 HYDRAULIC PRESSURE DIAGNOSIS

JLG Parts Department has a kit available to use for hydraulic system maintenance and troubleshooting: the JLG Pressure Test Kit. The kit is contained in a durable polyethylene carrying case for demanding field service conditions.

Hydraulic Pressure Test Kit

The hydraulic pressure test kit is used to pressure test the various hydraulic components in the hydraulic system. The kit includes:

- Gauges for testing high and low pressure circuits
- Fittings, couplers and hoses



Contact JLG Parts Department Toll Free at 1-877-554-5438 or 717-485-6472 for ordering information.

Part Number	Description	Approximate Weight	Price and Availability
70000652	Dial Hydraulic Pressure Test Kit	10 lbs.	Consult Factory
70000101	Digital Hydraulic Pressure Test Kit	7 lbs.	Consult Factory
70027911	Digital Hydraulic Pressure Test Kit	7 lbs.	Consult Factory



8.3.1 Pressure Checks and Adjustments

When diagnosing trouble in the hydraulic system, use the hydraulic testing information in Section 8.4.1, "Hydraulic Pressures."

In general, follow the steps below whenever conducting pressure checks and performing adjustments:

1. Park the machine on a firm, level surface. Engage the park brake, place the travel select lever in (N) NEUTRAL, level the boom and turn the engine OFF.
2. The test port is located at the top right corner of the main control valve. Install a pressure gauge capable of measuring at least 10% more pressure than that which the circuit being checked operates under.
3. Start the engine. Operate machine functions several times to allow hydraulic oil to reach operating temperature. The hydraulic oil temperature should be between 100-120°F (38-49° C). If a temperature gauge or thermometer is unavailable, the hydraulic oil reservoir should be warm to the touch.
4. Refer to Section 8.4.1, "Hydraulic Pressures," for testing procedures.
5. Fully depress the accelerator pedal if required. Place and hold the joystick in the position needed to operate the particular machine function being checked. Continue holding the joystick in position until pressure readings are taken.
6. Check the pressure gauge reading. It should read as specified in the Pressure Readings column of the charts found in Section 8.4.1, "Hydraulic Pressures." If the reading is not as specified, turn the engine OFF and check other components in the system. Verify that all related hydraulic components and electrical switches, sensors, solenoids, etc. are operating correctly.
7. Adjust the relief valve by turning the adjustment screw. Turning clockwise will increase the pressure; turning the screw counterclockwise will decrease the pressure.
8. Start the engine and check the pressure again. Turn the engine OFF. If there is pressure reading in the gauge, bleed it off then disconnect or remove the pressure gauge from the machine.

8.4 HYDRAULIC CIRCUITS

This section covers the hydraulic circuits and includes listings for all hydraulic function pressures, where and how to check those pressures and a hydraulic schematic.

Electrical and hydraulic functions are often related. Verify that the electrical components of the circuit are functioning properly whenever troubleshooting the hydraulic circuit.

Always check the following before beginning to troubleshoot a circuit that is not functioning correctly.

1. Check the hydraulic oil level in the reservoir. Oil level should be to the middle of the sight glass with all cylinders retracted.
2. Check hoses, tubes, fittings and other hydraulic components for leaks, bends, kinks, interference, etc.
3. Check for air in the hydraulic system. Erratic machine performance and/or spongy cylinder operation are signs of air in the hydraulic system.

If air in the hydraulic system is suspected, you will hear air leakage when hydraulic fittings are loosened and see air bubbles in the hydraulic fluid.

Loose fittings, faulty o-rings or seals, trapped oil, leaks, system opened for service, etc., can cause air in the system. Determine what is causing air to enter the system and correct it. Bleed air from the system.



Hydraulic System

8.4.1 Hydraulic Pressures

a. Checking Pressure

1. Start the machine and warm the hydraulic system to operating temperature.
2. Shut off the machine and install a gauge of suitable pressure rating according to the following chart to the appropriate test port.

Test Location	Gauge	Fittings
2, 3, 4, 5	4000 psi gauge (280 bar gauge)	Unit equipped with fittings from factory.
6, 7, 8, 10	1000 psi gauge (70 bar gauge)	Unit equipped with fittings from factory.
9	4000 psi gauge (280 bar gauge)	Requires a male or female quick disconnect coupler.

CAUTION

GAUGE DAMAGE may occur. Malfunctioning hydraulic system circuits may have excessive pressure and can cause hydraulic pressure spikes. Test circuit with the highest reading pressure gauge first. If this gauge cannot record an accurate pressure reading, use the next lower pressure gauge.

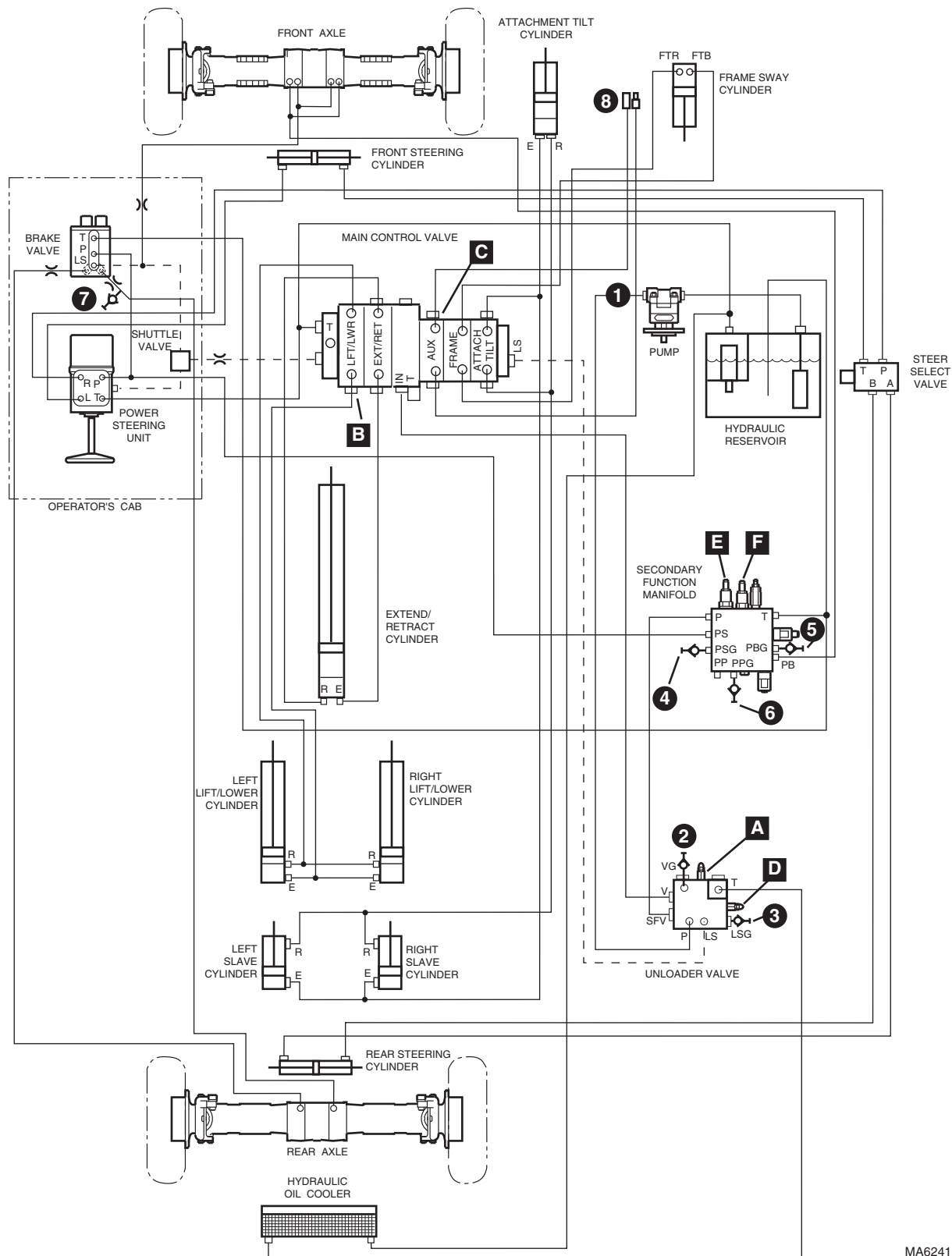
3. Start the machine, run the engine and follow the procedures in Section 8.4.1, e. "Pressure Specifications (8042, 10042 & 10054)."

b. Adjusting Hydraulic Pressure

1. Shut the machine off. Remove the cap on the relief (if necessary).
2. Start the machine and loosen the jam nut on the relief. Turn the relief clockwise to increase pressure or counter-clockwise to decrease pressure. Set to the correct pressure.
3. Tighten the jam nut and recheck the pressure at full throttle. If the reading is within specification, shut the machine off, install the safety cap and remove the gauge from the test port.
4. If the proper pressure cannot be set, use the accompanying hydraulic schematic and/or the electrical schematic to help troubleshoot and correct the problem.



c. Pressure Specifications (6036)



MA6241



Hydraulic System

Test Location	Hydraulic Pump Flow Test
1	To check flow readings, a flow meter capable of measuring 60 gpm (3,8 liter/sec) and a load valve capable of 6000 psi (413,4 bar) will be required. 2000 psi (137,8 bar) load @ Engine Speed of 2475 - 2525 rpm - Flow rate should be 28-32 GPM (1,8-2,0 liter/sec)

Test Location	Adjust. Location	Component Description	Pressure Reading	Pressure Test Procedures
2	A	Unloader Valve	Main System Relief 2900-3100 psi (200-214 bar)	With engine at idle, use the boom control lever to fully retract the boom. Hold over relief and check pressure. If pressure is incorrect, adjust or replace cartridge.
2	B	Unloader Valve	Lift/Lower Relief 2900-3100 psi (200-214 bar)	Remove the carriage if attached. With engine at full throttle, use the boom control lever to lower boom fully. Hold over relief and check pressure. If pressure is incorrect, adjust or replace cartridge.
2	N/A	Attachment Tilt Relief/ FORWARD or REARWARD	3150-3250 psi (217-224 bar)	CONSULT FACTORY
2	D	Unloader Valve	Standby Pressure 250-300 psi (17-21 bar)	With engine at idle and no functions operated, check standby pressure. If pressure is incorrect, adjust or replace the differential pressure sense cartridge on the unloader valve.
3	N/A	Unloader Valve	Load Sense 0-3000 psi (0-207 bar)	With engine at idle, load sense at 0 psi. With engine at FULL throttle, use the boom control lever to fully retract the boom. Hold over relief. Pressure should be 2750-3000 psi (190-207 bar).
4	E	Secondary Function Manifold	Steering Relief 2400-2600 psi (165-179 bar)	With engine at FULL throttle, turn the steering wheel all the way in one direction and hold while checking pressure. If pressure is incorrect, adjust or replace the pressure-reducing cartridge.
5	F	Secondary Function Manifold	Park Brake minimum 400 psi (28 bar) maximum 550 psi (38 bar)	With engine at idle, park brake released and no functions operated, pressure should be 400 psi (28 bar) minimum. With engine at idle, park brake released and steering held over relief, pressure should be 550 psi (38 bar) maximum. If pressure is incorrect, adjust or replace the pressure reducing valve in the secondary function manifold. When adjusting the pressure reducing valve, connect gauge to location 6. With engine at idle and steering held over relief, adjust valve until gauge reads 500-550 psi (34-38 bar).
7	N/A	Brake Valve (Manual Brake Pressure)	400 psi (28 bar) minimum	With engine OFF, pump brake pedal twice. DO NOT overstroke the brake pedal. If pressure is incorrect, check for external leaks. If no leaks are found, refer to Section 8.7.3, "Service Brake Valve."
7	N/A	Brake Valve (Service Brake Pressure)	550 psi (38 bar) minimum	With engine at idle, depress and hold brake pedal. DO NOT turn the steering wheel. DO NOT overstroke the brake pedal. Check pressure. If pressure is incorrect, refer to Section 8.7.3, "Service Brake Valve."

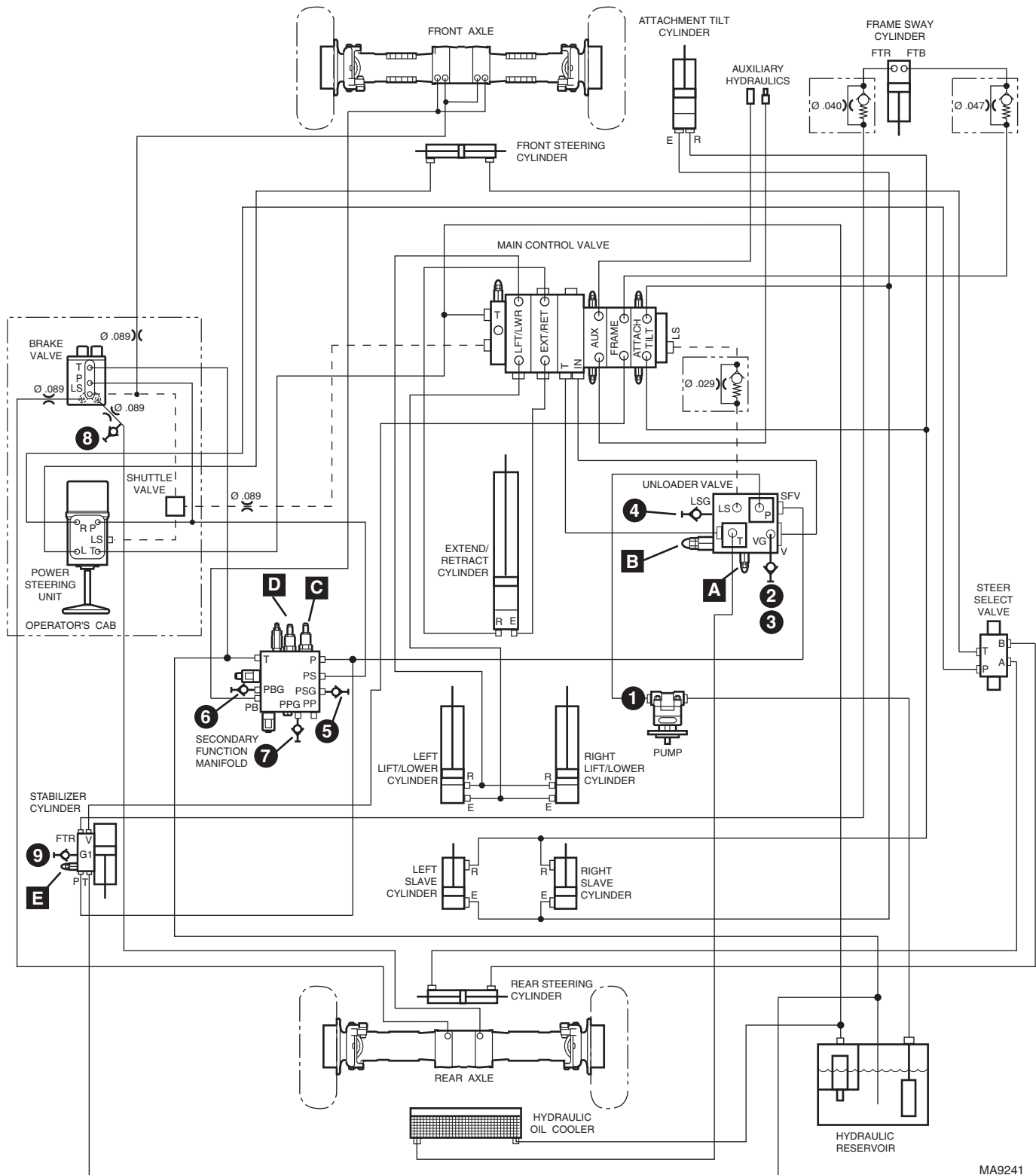


Test Location	Adjust. Location	Component Description	Pressure Reading	Pressure Test Procedures
8	C	Auxiliary Hydraulics	3000 psi (207 bar)	With engine at low idle, move auxiliary control lever left or right. Hold auxiliary control lever over relief and check pressure. If pressure is incorrect, check unloader pressure per location 2 . If location 2 is ok, check port reliefs on the aux section of main control valve.



Hydraulic System

d. Pressure Specifications (6042)



MA9241



Test Location	Hydraulic Pump Flow Test
1	To check flow readings, a flow meter capable of measuring 60 gpm (3,8 liter/sec) and a load valve capable of 6000 psi (413,4 bar) will be required. 2000 psi (137,8 bar) load @ Engine Speed of 2475 - 2525 rpm - Flow rate should be 34-40 GPM (2,1-2,5 liter/sec)

Test Location	Valve Port	Adjust. Location	Component Description	Pressure Reading	Pressure Test Procedures
2	VG	A	Unloader Valve	Main System Relief 2900-3100 psi (200-214 bar)	With engine at high idle, use the boom control lever to fully retract the boom. Hold over relief and check pressure. If pressure is incorrect, adjust or replace cartridge.
2		A	Auxiliary Hydraulics	2900-3100 psi (200-214 bar)	With engine at high idle, move auxiliary control lever left or right. Hold auxiliary control lever over relief and check pressure. If pressure is incorrect, check unloader pressure per location 2. If location 2 is ok, check port reliefs on the aux section of the main control valve.
2	VG	N/A	Attachment Tilt Relief/ FORWARD or REARWARD	2900-3100 psi (200-214 bar)	CONSULT FACTORY
3	VG	B	Unloader Valve	Standby Pressure 250-300 psi (17-21 bar)	Note: DO NOT touch any functions while the pressure gauge is connected. You will damage the pressure gauge. With engine at idle and no functions operated, check standby pressure. If pressure is incorrect, adjust or replace the differential pressure sense cartridge on the unloader valve.
4	LSG	N/A	Unloader Valve	Load Sense 0-3000 psi (0-207 bar)	With engine at idle, load sense is 0 psi. With the engine at FULL throttle, use the boom control lever to fully retract the boom. Hold over relief. Pressure should be 2750-3000 psi (190-207 bar).
5	PSG	C	Secondary Function Manifold	Steering Relief 2400-2600 psi (165-179 bar)	With engine at FULL throttle, turn the steering wheel all the way in one direction and hold while checking pressure. If pressure is incorrect, adjust or replace the pressure-reducing cartridge.
6	PBG	N/A	Secondary Function Manifold	Park Brake minimum 400 psi (28 bar) maximum 500-600 psi (34-41 bar)	With engine at idle, park brake released and no functions operated, pressure should be 400 psi (28 bar) minimum. With engine at idle, park brake released and steering held over relief, pressure should be 500-600 psi (34-41 bar) maximum. After releasing steering wheel, the pressure MUST NOT drop more than 50 psi in one minute. If pressure drop is incorrect, refer to Section 8.7.3, "Service Brake Valve." If pressure is incorrect, adjust per test 7.

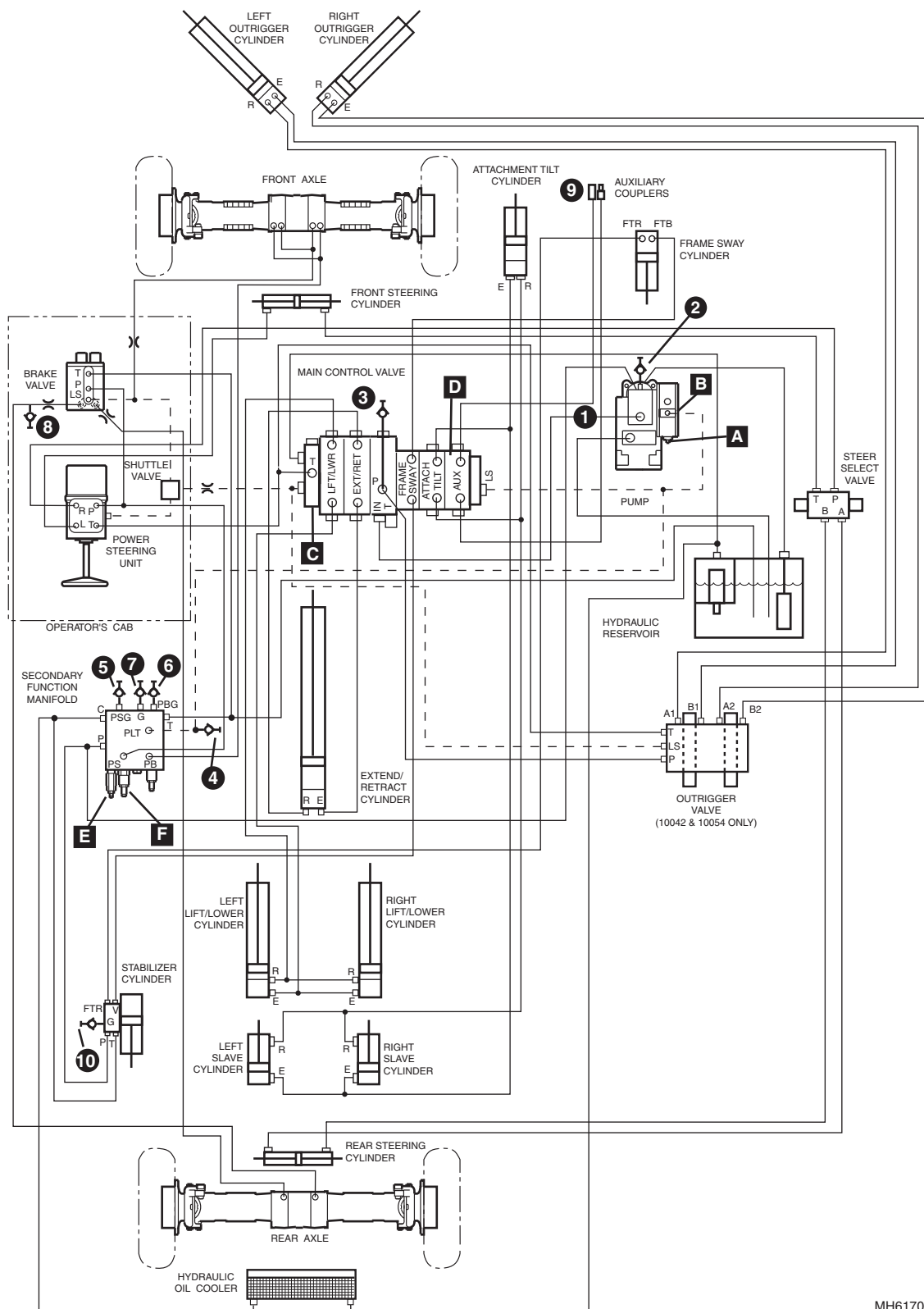


Hydraulic System

Test Location	Valve Port	Adjust. Location	Component Description	Pressure Reading	Pressure Test Procedures
7	PBG	D	Secondary Function Manifold	500-600 psi (34-41 bar)	With engine at idle, park brake released and steering held over relief while checking pressure. If pressure is incorrect, adjust or replace the pressure reducing valve in the secondary function manifold.
8		N/A	Brake Valve (Manual Brake Pressure)	400 psi (28 bar) minimum	With engine OFF, pump brake pedal twice. DO NOT overstroke the brake pedal. If pressure is incorrect, check for external leaks. If no leaks are found, refer to Section 8.7.3, "Service Brake Valve."
8		N/A	Brake Valve (Service Brake Pressure)	550 psi (38 bar) minimum	With engine at idle, depress and hold brake pedal. DO NOT turn steering wheel. DO NOT overstroke the brake pedal. Check pressure. If pressure is incorrect, refer to Section 8.7.3, "Service Brake Valve."
9	G1	E	Stabilizer Cylinder	75-150 psi (5,2-10,3 bar)	With engine at idle, check the pressure on the cylinder.



e. Pressure Specifications (8042, 10042 & I 10054)



MH6170



Hydraulic System

Test Location	Hydraulic Pump Flow Test
1	To check flow readings, a flow meter capable of measuring 60 gpm (3,8 liter/sec) and a load valve capable of 6000 psi (413,4 bar) will be required. 2000 psi (137,8 bar) load @ Engine Speed of 2475 - 2525 rpm - Flow rate should be 48.9 GPM (3 liter/sec)

Test Location	Adjustment Location	Component Description	Pressure Reading	Pressure Test Procedures
2	A	Pump Standby Pressure	550-600 psi (38-41 bar)	Loosen load sense line at location B to bleed off pressure, and then retighten line. With engine at idle and no hydraulic functions operated, check pump standby pressure. If pressure is incorrect, adjust top screw on compensator.
2	N/A	Pump Pressure Compensator	3300 psi (228 bar)	With engine at idle, turn steering wheel all the way in one direction. Hold over relief and check maximum pump pressure. If pressure is incorrect, consult factory.
3	C	Main Control Valve	System Relief 2900-3100 psi (200-214 bar)	With engine at FULL throttle, use the boom control lever to fully retract the boom. Hold over relief and check pressure. If pressure is incorrect, adjust and replace cartridge.
3	N/A	Attachment Tilt Relief/ FORWARD or REARWARD	2900-3100 psi (200-214 bar)	CONSULT FACTORY
4	N/A	Secondary Function Manifold	Load Sense 0-3000 psi (0-207 bar)	With engine at idle, load sense is 0 psi. With engine at idle, use the boom control lever to fully retract the boom. Hold over relief and check pressure. Pressure should be 3000 psi (207 bar).
5	E	Secondary Function Manifold	Steering Relief 2400-2600 psi (165-179 bar)	With engine at idle, turn the steering wheel all the way in one direction. Hold over relief and check pressure. If pressure is incorrect, adjust or replace the pressure reducing cartridge.
6	N/A	Secondary Function Manifold	Park Brake Release 500-600 psi (34-41 bar)	With engine at idle and no hydraulic functions operated, disengage the park brake, check pressure. This is not an adjustment.
7	F	Secondary Function Manifold	Park Brake Pressure 500-600 psi (34-41 bar)	With engine at idle and park brake released, turn the steering wheel all the way in one direction. Hold over relief and check pressure. If pressure is incorrect, adjust or replace the pressure reducing cartridge in the secondary function manifold.
8	N/A	Brake Valve (Manual Brake Pressure)	minimum 400 psi (28 bar)	With engine OFF, pump brake pedal twice. DO NOT overstroke the brake pedal. If pressure is incorrect, check for external leaks. If no leaks are found, refer to Section 8.7.4, "Brake Test."



Test Location	Adjustment Location	Component Description	Pressure Reading	Pressure Test Procedures
8	N/A	Brake Valve (Service Brake Pressure)	minimum 550 psi (38 bar)	With engine at idle, depress and hold brake pedal. DO NOT turn steering wheel. DO NOT overstroke the brake pedal. Check pressure. If pressure is incorrect, refer to Section 8.7.4, "Brake Test."
9	D	Auxiliary Hydraulics	3000 psi (207 bar)	With engine at low idle, move auxiliary control lever left or right. Hold control lever over relief and check pressure. If pressure is incorrect, check main relief per location 3.
10	N/A	Stabilizer Cylinder	75-150 psi (5,2-10,3 bar)	With the engine at idle, check the pressure of the cylinder.



a. Model 6036

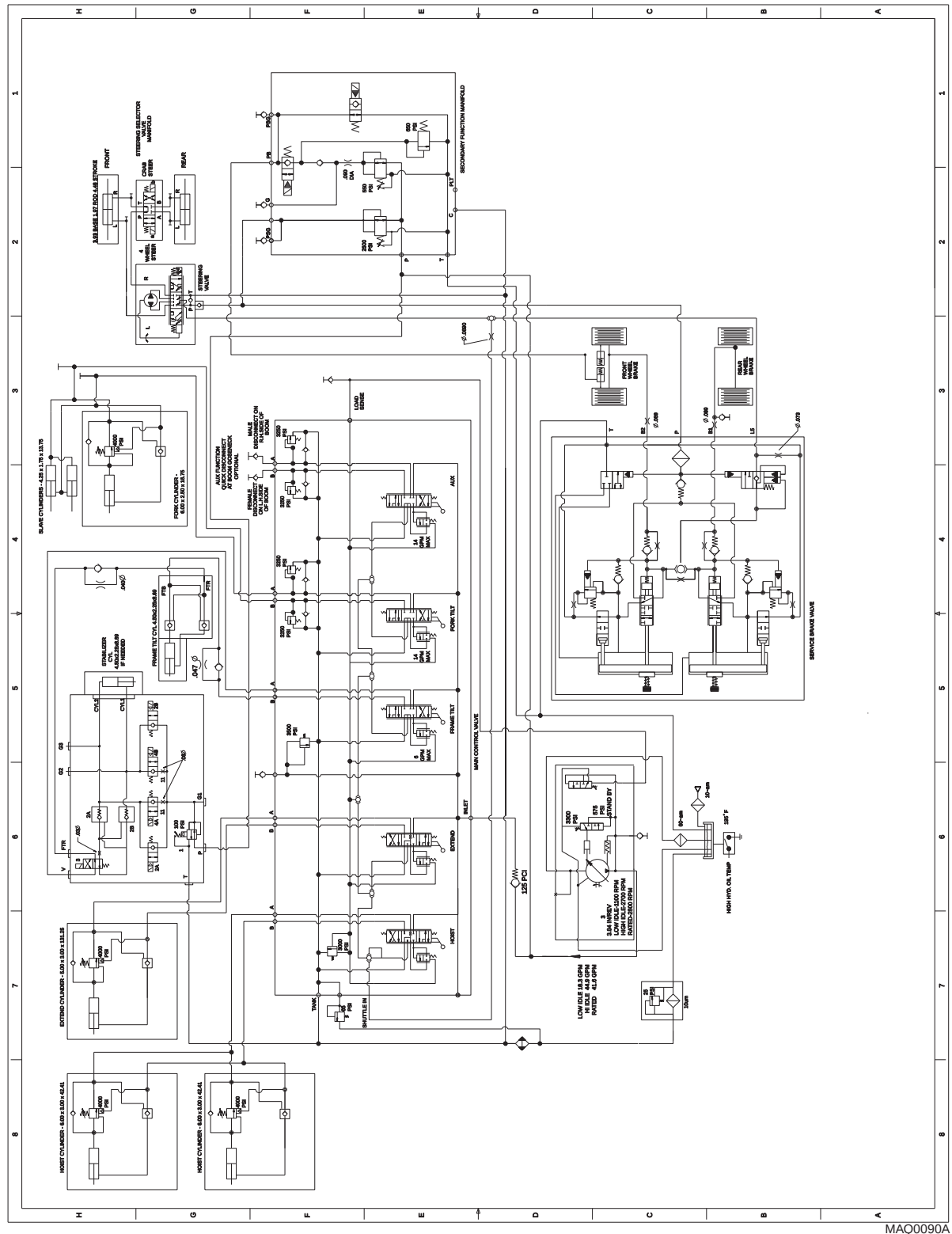


8-17



Hydraulic System

c. Model 8042



This hydraulic schematic diagram illustrates the fluid power system for a vehicle, likely a truck or heavy machinery. The system is composed of several key components and interconnected circuits:

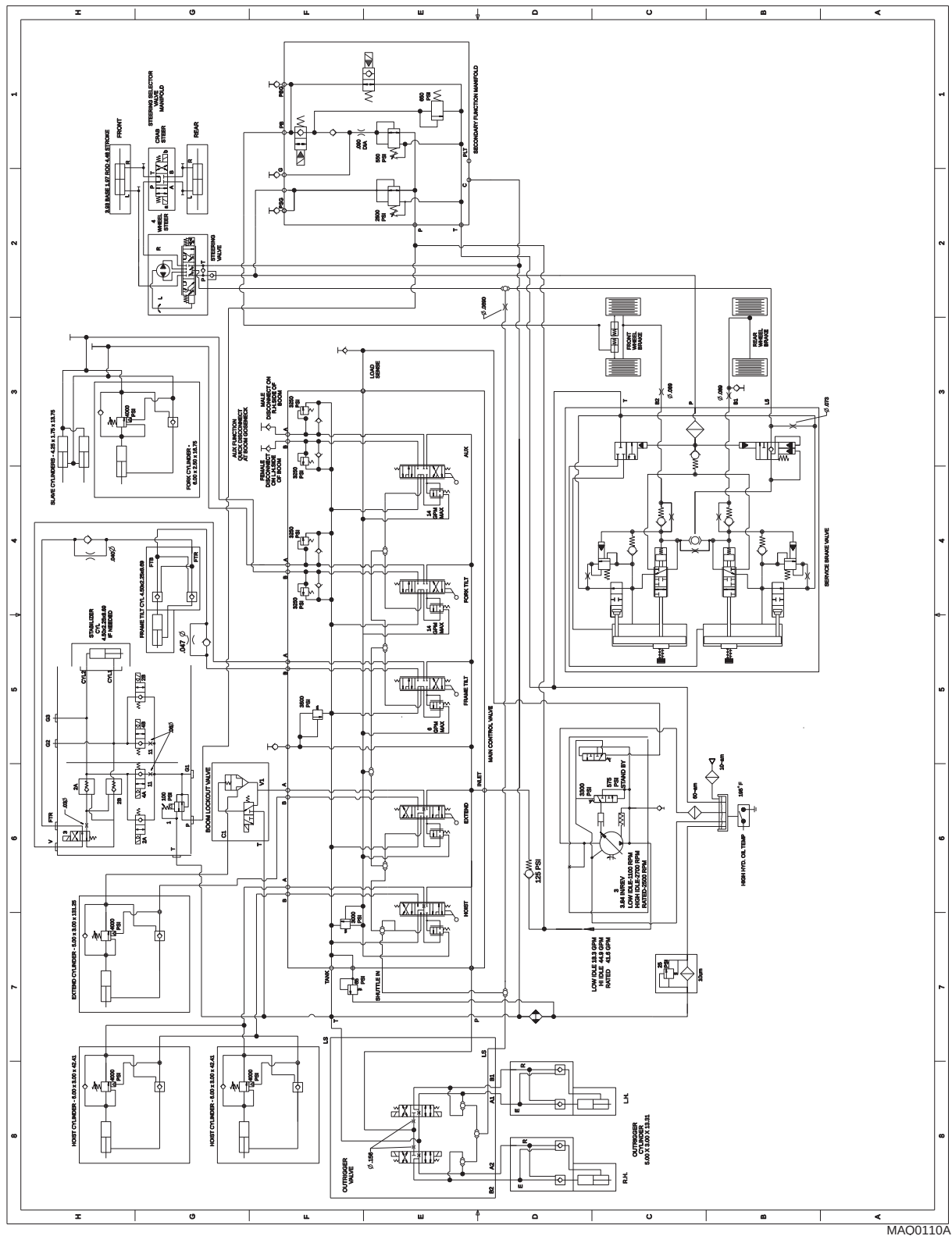
- Fluid Power Sources:**
 - Primary Pump:** A 5.0A 1.000 GPM pump driven by a 120V 1.000 HP motor, providing the main hydraulic pressure.
 - Secondary Pump:** A 1.0A 0.250 GPM pump driven by a 120V 0.250 HP motor, used for auxiliary functions.
 - Accumulator:** A 1.0A 0.250 GPM accumulator, likely for energy storage and shock absorption.
- Control and Safety Components:**
 - Pressure Relief Valve:** Set at 1500 PSI to protect the system from overpressure.
 - Check Valve:** Prevents backflow of hydraulic fluid.
 - Flow Control Valve:** Regulates the flow rate to actuators.
 - Temperature Sensor:** Monitors the hydraulic oil temperature.
- Actuators (Cylinders):**
 - Master Cylinder:** 1.0A 0.250 GPM, 1500 PSI, used for primary control.
 - Slave Cylinder:** 1.0A 0.250 GPM, 1500 PSI, used for secondary control.
 - Stabilizer Cylinder:** 1.0A 0.250 GPM, 1500 PSI, used for stabilizing the load.
 - Frame Tilt Cylinder:** 1.0A 0.250 GPM, 1500 PSI, used for tilting the frame.
 - Port Tilt Cylinder:** 1.0A 0.250 GPM, 1500 PSI, used for tilting the port.
 - Shuttle Valve:** 1.0A 0.250 GPM, 1500 PSI, used for switching between different functions.
 - Outboard Valve:** 1.0A 0.250 GPM, 1500 PSI, used for outboard functions.
 - Service Brake Valve:** 1.0A 0.250 GPM, 1500 PSI, used for the service brake.
- Valves and Manifolds:**
 - Interlocking Valve:** Ensures that certain functions cannot be performed simultaneously.
 - Interlocking Manifold:** A manifold that coordinates the operation of multiple valves.
 - Interlocking Valve:** A valve that prevents the system from operating in a dangerous state.
- Hydraulic Oil:** The system uses a 15W-40 hydraulic oil, which is specified for the operating temperature range of 100°F to 200°F.

The diagram shows the complex interconnections between these components, including the main hydraulic line, the control line, and the various branches leading to the actuators and valves. The system is designed to provide precise control and safe operation of the vehicle's hydraulic functions.



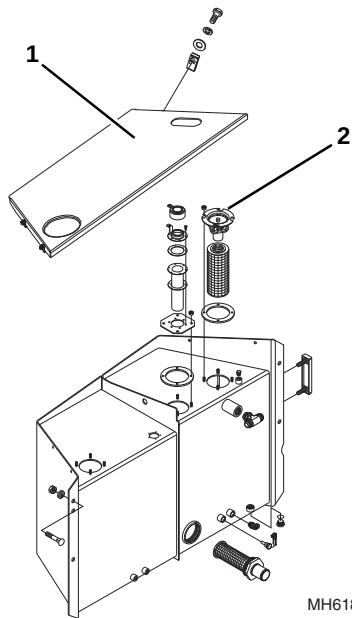
Hydraulic System

e. Model 10054





8.5 HYDRAULIC RESERVOIR



The hydraulic reservoir (1) and the fuel tank are one unit. They are located on the right side of the frame under a cover.

Occasionally, fluid may seep, leak or be more forcefully expelled from the filter head (2) when system pressure exceeds the rating of the filter head or breather. If the return filter becomes plugged, return hydraulic oil will bypass the filter when pressure reaches 25 psi (1,7 bar) and return to the reservoir unfiltered.

Carefully examine fluid seepage or leaks from the hydraulic reservoir to determine the exact cause. Clean the reservoir and note where any seepage occurs.

Leaks from a cracked or damaged reservoir require that the reservoir be removed from the machine, flushed completely with water and repaired by a certified welder using approved techniques. If these conditions cannot be met, the reservoir must be replaced in its entirety.

8.5.1 Hydraulic Oil Reservoir Draining

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.

5. Open the filler cap on the hydraulic oil reservoir. Remove the drain plug on the side of the hydraulic oil reservoir.
6. Transfer the used hydraulic oil into a suitable covered container, and label as "Used Oil". Dispose of used oil at an approved recycling facility. Clean and reinstall the drain plug.
7. Wipe up any hydraulic fluid spillage in, on, near and around the machine and the work area.

8.5.2 Hydraulic Oil Reservoir Filling

1. Be sure the reservoir is clean and free of all debris.
2. Install a new hydraulic oil filter.
3. Fill the reservoir with Mobilfluid 424® (ISO Grade 46) oil. Refer to Section 2.4, "Fluid and Lubricant Capacities."
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Close and secure the rear door.

8.5.3 Hydraulic Oil Reservoir Replacement

The hydraulic reservoir and fuel tank are one unit and are removed together. Refer to Section 7.6.2, "Fuel/Hydraulic Oil Tank," for information on hydraulic reservoir/fuel tank replacement.



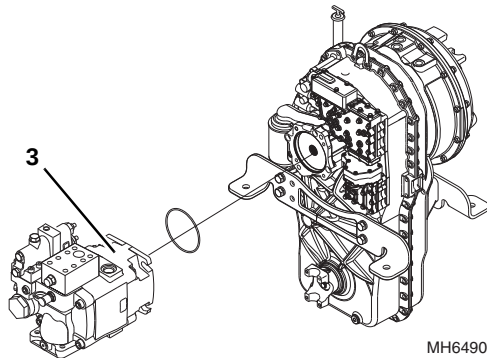
8.6 HYDRAULIC SYSTEM PUMP

For internal service instructions contact your local authorized service distributor.

8.6.1 Pump Replacement

a. Pump Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. Properly disconnect the battery.
6. Drain the hydraulic reservoir. Refer to Section 8.5.1, "Hydraulic Oil Reservoir Draining."



7. Thoroughly clean the pump (3) and surrounding area, including all hoses and fittings before proceeding.
8. Label, disconnect and cap the hydraulic hoses attached to the pump.
9. Remove the bolts, lockwashers and washers securing the pump to the transmission. Remove the o-ring located between the transmission and the pump. Wipe up any hydraulic oil spillage.
10. Remove the hydraulic fittings from the pump to use for later installation.

Note: Before removing any fittings from the pump, note their orientation to ensure correct installation.

Note: DO NOT disassemble the operating pump. The pump is pre-set from the manufacturer. Any adjustments or repairs performed by anyone other than an authorized dealer could void the warranty.

b. Pump Installation

1. Install the fittings on the pump in the same orientation as noted during removal.
2. Place the pump and a new, oiled o-ring into position on the transmission. Align the pump shaft with the internal transmission gear, so that the machined teeth mesh together.
3. Align the bolt holes with the pump mount holes. Secure the pump to the transmission with the previously used hardware.
4. Uncap and connect the previously labeled hydraulic hoses to their appropriate locations.
5. Fill the hydraulic reservoir. Refer to Section 8.5.2, "Hydraulic Oil Reservoir Filling."
6. Prime the pump by filling the case drain port with fresh, filtered hydraulic oil from a clean container before installing the case drain connector and hose.
7. Check all routing of hoses and tubing for sharp bends or interference with any rotating members. All tube and hose clamps must be tight.
8. Properly connect the battery.
9. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
10. Close and secure the rear door.
11. Start the engine and run at approximately one-third to one-half throttle for about one minute without moving the machine or operating any hydraulic functions.
12. Inspect for leaks and check all fluid levels. The hydraulic reservoir oil level must be to the middle of the sight gauge.

c. Pump Test

Refer to Section 8.3.1, "Pressure Checks and Adjustments."



8.7 VALVES AND MANIFOLDS

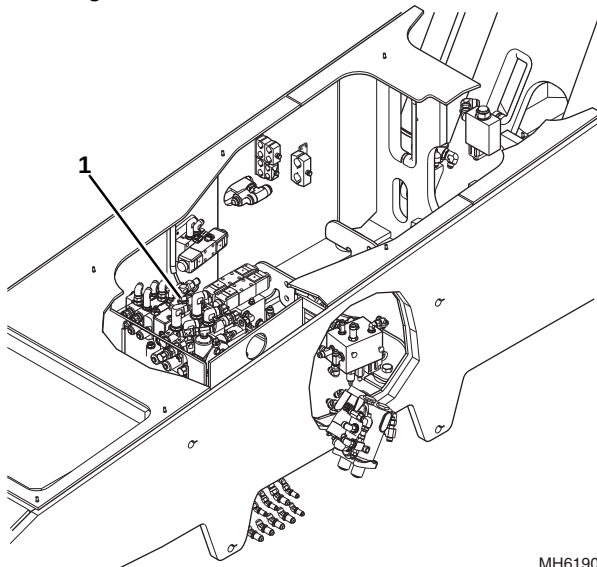
8.7.1 Main Control Valve

The main control valve is mounted on the frame under the lower transmission cover.

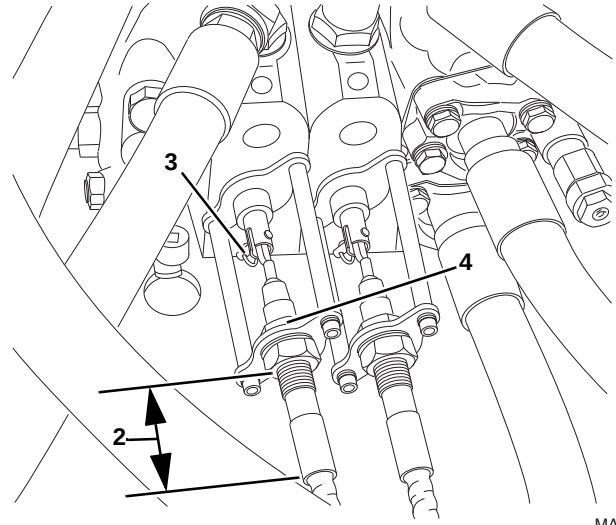
The main control valve assembly consists of individual working sections with their own valve assemblies, each providing a specific hydraulic function.

a. Main Control Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. With the engine OFF, operate all the hydraulic functions to relieve trapped pressure.
6. Remove the transmission covers. Thoroughly clean the main control valve and surrounding area, including all hoses and fittings, before proceeding.
7. Place a suitable container to catch hydraulic fluid drainage beneath the frame.



8. Label, disconnect and cap all the hydraulic hoses, tubes and wires at the main control valve (1).
9. Wipe up any hydraulic fluid spillage in, on, near and around the machine and the work area.



10. Record the distance (2) from the outer jam nut to the end of the ferrule on all cables, to ensure correct adjustment when reinstalling cables.

Note: Record the location, and label all cables to ensure correct installation.

11. Disconnect the control cables:
 - a. Remove the spring pin (3) and anchor pin. Save the spring pin and anchor pin for installation.
 - b. Loosen the outer jam nut (4), and remove the control cable from the bracket. Save the jam nut for installation.
 - c. Route the cable clear of the main control valve.
 - d. Repeat steps for the remaining control cables.
12. Remove the bolts and nuts (3) securing the main control valve to the frame.
13. Remove the main control valve from the frame.

b. Main Control Valve Disassembly

1. To disassemble the individual sections of the main control valve, remove the nuts from one end of the tie rods. Pull the tie rods out through the sections.

2. Disassemble each section assembly as required.

Some sections include a pre-adjusted relief valve that regulates pressure in a specific circuit.

Note: DO NOT adjust any of the relief valve assemblies. Tampering with a relief valve will irrevocably alter pressure in the affected circuit, requiring recalibration or a new relief valve.



Hydraulic System

Disassemble each Valve Section

1. Carefully separate the load sense outlet section from the next section.
2. Remove the o-rings from between the two sections.
3. Carefully separate each remaining sections, being careful not to lose the load sense shuttle ball.
4. Remove both end caps from each end of the valve sections then remove each control spool.
5. Remove any check valves, compensator valves, anti-cavitation valves or shock valves from individual valve section if equipped.
6. Keep all parts being removed from individual valve sections tagged and kept together.

c. Main Control Valve Parts Cleaning

Clean all components with a suitable cleaner, such as trichlorethylene, before continuing. Blow dry.

d. Main Control Valve Parts Inspection

Inspect all parts and internal passageways for wear, damage, etc. If inner surfaces of any component DO NOT display an ultra-smooth, polished finish, or are damaged in any way, replace the damaged part. Often, dirty hydraulic fluid causes failure of internal seals, damage to the polished surfaces within the component, and wear of and/or harm to other parts.

e. Main Control Valve Assembly

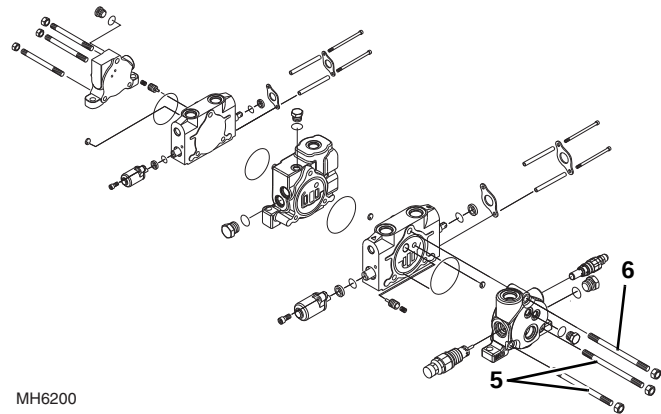
Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

Assemble each Valve Section

1. Reassemble any check valves, compensator valves, anti-cavitation valves or shock valves from each individual valve sections if equipped.
2. Install the control spool being careful not to nick or scratch the valve section bore or the control spool.
3. Install the end caps on each end of the valve section.

Assemble the Main Control Valve.

1. Place all three tie rods with the nuts through the end main control valve section.
2. Stand the end main control valve section on end.
3. Install the proper o-rings and load sense shuttle on the inner face of the end main control valve section. Align the next valve section over the three tie rods and slide onto the end main control valve section.
4. Using the proper o-rings and load sense shuttle, repeat step three for the remaining valve sections and lastly the inlet end valve section.

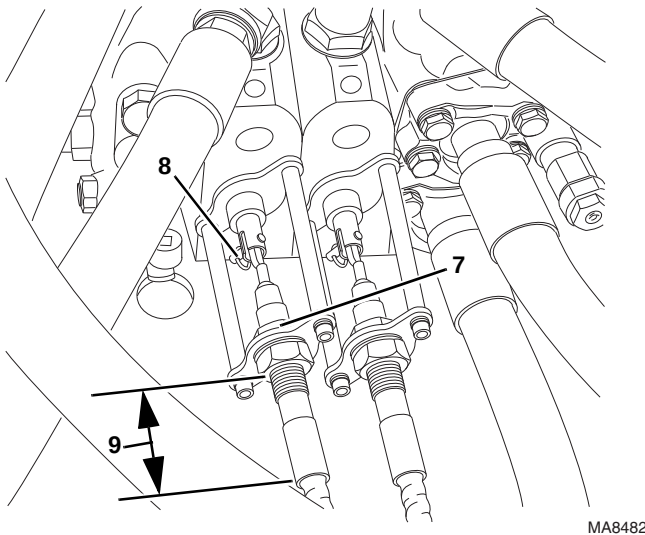


5. Install the three nuts on the tie rods. Torque the two bottom nuts (5) to 43-53 lb-ft (58-72 Nm). Torque the top nut (6) to 66-82 lb-ft (89-111 Nm).



f. Main Control Valve Installation

1. Install the main control valve onto the frame, aligning the bolts with the holes in the end sections of the main control valve. Slide the main control valve into position, and tighten the bolts.
2. Prime the main control valve by filling the inlet openings with fresh, filtered hydraulic oil from a clean container, before attaching the hoses.
3. Use new oiled o-rings as required. Uncap and connect all previously labeled hoses, clamps, etc. to the main control valve.



4. Connect the control cables to the main control valve:
 - a. Slide the outer jam nut (7) over the end of the control cable, and install the cable in the bracket with one nut on either side of the bracket. DO NOT tighten the jam nuts at this time.
 - b. Connect the end of the cable to the shaft from the control valve. Secure with an anchor pin and spring pin (8).
 - c. Adjust the jam nuts until the distance (9) from the outer jam nut to the end of the ferrule is the same as recorded during removal. Tighten the jam nuts.
 - d. Repeat steps for remaining control cables.
5. Check the routing of all hoses, wiring and tubing for sharp bends or interference with any rotating members, and install tie wraps and/or protective conduit as required. Tighten all tube and hose clamps.
6. Fill the hydraulic fluid reservoir. Refer to Section 8.5.2, "Hydraulic Oil Reservoir Filling."

7. Start the engine and run at approximately one-third to one-half throttle for about one minute without moving the machine or operating any hydraulic functions.
8. Inspect for leaks and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

9. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
10. Install the transmission covers.
11. Close and secure the rear door.

g. Main Control Valve Test

Conduct a pressure check of the hydraulic system in its entirety. Adjust pressure(s) as required. Refer to Section 8.3.1, "Pressure Checks and Adjustments."

8.7.2 Secondary Function Manifold

The secondary function manifold is a directional control valve. Hydraulic oil from the pump flows into the secondary function manifold where the pressure is reduced before the oil is directed to the power steering unit or the park brake.

The secondary function manifold is a machined block with the ports for two pressure reducing valves, a pressure relief valve, two park brake solenoid valves (one normally open and one normally closed), a check valve and diagnostic test nipples. The secondary function manifold is secured on the left side of the frame with two carriage bolts and two hex flange nuts.

Verify the correct operation of the solenoids before considering replacement of the secondary function manifold. The manifold itself is not serviceable and must be replaced if defective.

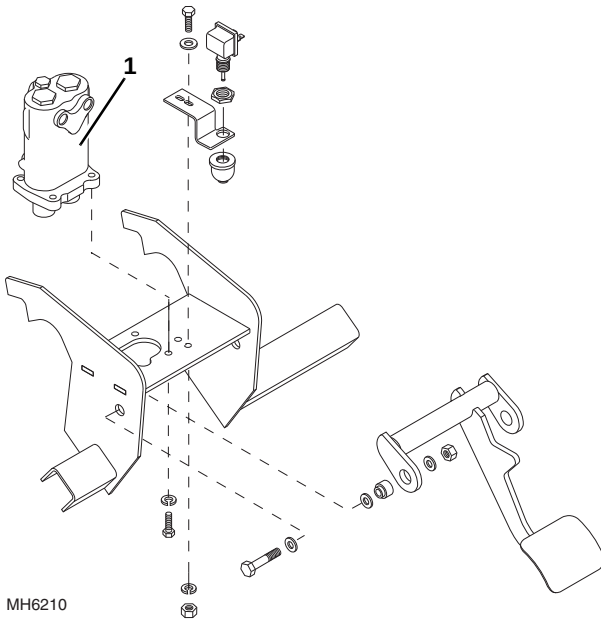
Note: DO NOT loosen, disassemble or attempt to adjust any of the pressure valves unless specifically instructed by the manufacturer to do so. Tampering with a pressure valve will irrevocably alter pressure in the affected circuits.



8.7.3 Service Brake Valve

a. Service Brake Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the lower and front dash panels.



6. Label, disconnect and cap all hose attached to the service brake valve (1).
7. Remove the four capscrews and four lockwashers mounting the service brake valve to the steering column support.

Note: DO NOT disassemble the service brake valve. The service brake valve is not serviceable and must be replaced in its entirety, if defective.

b. Service Brake Valve Installation

1. Install the service brake valve with the four capscrews and four lockwashers onto the steering column support.

Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

2. Use new oiled o-rings as required. Uncap and connect the previously labeled hoses to the service brake valve.
3. Check the routing of all hoses, and tubing for sharp bends or interference with any rotating members, and install tie wraps and/or protective conduit as required. Tighten all tube and hose clamps.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Start the engine and run at approximately one-third to one-half throttle for about one minute, without moving the machine or operating any hydraulic functions.
7. Inspect the service brake valve and connections for leaks, and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks, and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

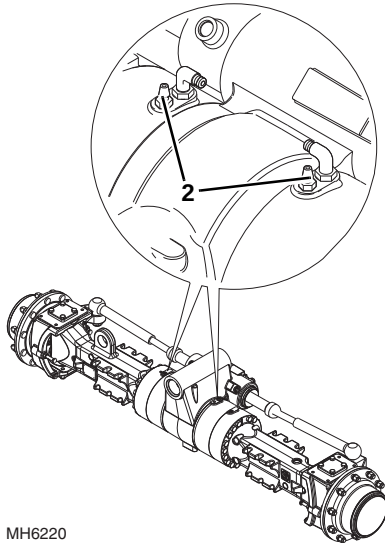
8. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
9. Install the lower and front dash panels.
10. Close and secure the rear door.



8.7.4 Brake Test

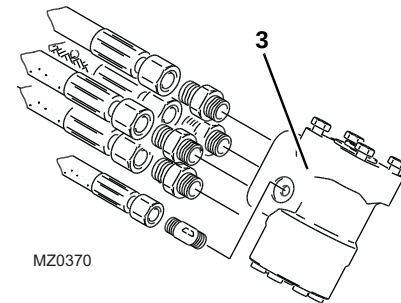
Carefully bleed the brake lines as soon as the brake valve is installed in the machine. Air in the system will not allow the brakes to apply properly. There are four brake bleeder locations on the axles. Work with an assistant to perform this procedure.

1. Place the travel select lever in (N) NEUTRAL, engage the park brake, and start the engine.



2. Remove the plastic cap from the brake bleeder (2). Attach one end of a length of transparent tubing over the brake bleeder. Place the other end of this tubing in a suitable transparent container that is partially filled with hydraulic oil. The end of the tubing must be below the oil level in the container.
3. DO NOT open the brake bleeder without holding the tubing firmly on the bleeder. There is pressure at the brakes. Carefully open the bleeder with a wrench. Have the assistant depress the brake pedal. Close the brake bleeder when air bubbles no longer appear in the oil. Release the brake pedal. Remove the tubing from the brake bleeder.
4. Repeat Steps 2 and 3 for the remaining brake bleeders.
5. Conduct a pressure and function check of the service brake. Refer to Section 8.4.1, "Hydraulic Pressures."

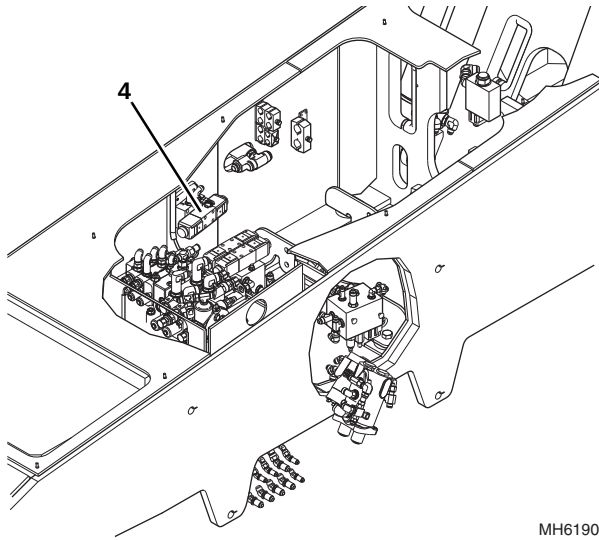
8.7.5 Power Steering Valve



The power steering valve (3) is located at the base of the steering wheel shaft, concealed by the lower dash cover. The valve is not serviceable and must be replaced in its entirety if defective. For detailed information refer to Section 4.3.1, "Steering Column and Steering Valve."



8.7.6 Steer Select Valve



The machine can be used in the front-wheel, four-wheel or crab steering mode. The steer select valve (4) controls the direction of hydraulic fluid flow to the steering cylinders mounted on each axle. The steer select valve is attached to a manifold mounted to a mounting plate inside the frame near the fuel tank.

Verify the correct operation of the steer select valve solenoids before considering replacement of the valve. The housing of the steer select valve is not serviceable and must be replaced if defective.

a. Steer Select Manifold and Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. Properly disconnect the battery.
6. Remove the transmission covers.
7. Label, disconnect and cap the hydraulic hoses and the electrical plugs connected to the steering select valve.
8. Remove the bolts holding the steer select valve to the mounting plate on the frame.
9. Remove the steer select manifold with the attached steer select valve from the machine. Wipe up any hydraulic fluid spillage in, on, near and around the machine.

b. Steer Select Manifold and Valve Disassembly, Cleaning, Inspection and Assembly

1. Place the steer select assembly on a suitable work surface.
2. Separate the steer select valve from the manifold by removing the four socket head capscrews. Discard the four o-rings.
3. Remove the solenoid valves and cartridges from the steer select housing.
4. Clean all components with a suitable cleaner before inspection.
5. Inspect the solenoid cartridges for proper operation. Check by shifting the spool to ensure that it is functioning properly. Check that the spring is intact. Inspect the cartridge interior for contamination.
6. Inspect internal passageways of the steer select manifold and valve for wear, damage, etc. If inner surfaces of the manifold DO NOT display an ultra-smooth, polished finish, or components are damaged in any way, replace the manifold or appropriate part. Often, dirty hydraulic fluid causes failure of internal seals and damage to the polished surfaces within the secondary function manifold.

Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

7. Install the solenoid valves and cartridges in the steer select housing.
8. Attach the steer select valve to the manifold using four new, oiled o-rings and the four socket head capscrews.

c. Steer Select Valve and Manifold Installation

1. Install the steer select valve to the mounting plate on the frame using two capscrews.
2. Connect all the previously labeled hydraulic hoses, fittings, solenoid wire terminal leads, etc., to the steer select valve.
3. Check the routing of all hoses, wiring and tubing for sharp bends or interference with any rotating members, and install tie wraps and/or protective conduit as required. Tighten all hose clamps.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.



6. Start the engine and run at approximately 1/3-1/2 throttle for about one minute without moving the machine or operating any hydraulic functions.
7. Inspect for leaks and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

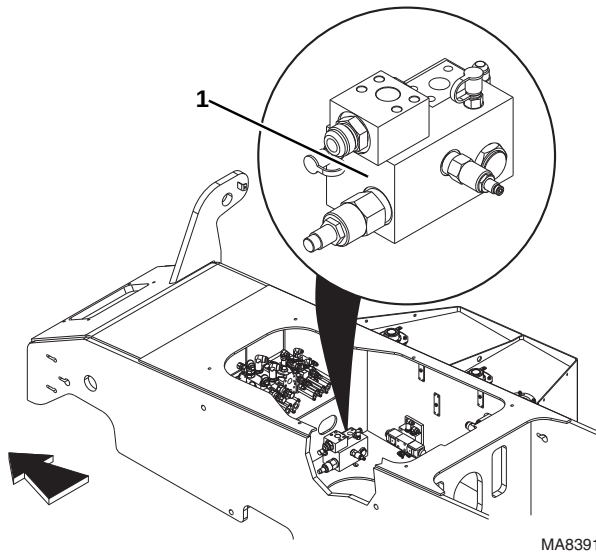
8. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
9. Install the transmission covers.
10. Close and secure the rear door.

d. Steering Test

Refer to Section 8.4.1, "Hydraulic Pressures."

1. Conduct a pressure check of the steering hydraulic circuit.
2. Check each steering mode for proper function.

8.7.7 Unloader Valve (6036 & 6042 only)



The unloader valve (1) creates system pressure and distributes the hydraulic fluid for various machine functions via its load sense, by to tank (via the oil cooler), and primary and secondary valve ports. The unloader valve is secured to the frame toward the front of the machine near the main control valve.

a. Unloader Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.

2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. Properly disconnect the battery.
6. Label, disconnect and cap the hydraulic hoses attached to the unloader valve. Cap all fittings to prevent dirt and debris from entering the hydraulic system.
7. Remove the hardware securing the unloader valve to the machine frame.
8. Remove the unloader valve.

b. Unloader Valve Disassembly

DO NOT loosen, disassemble or attempt to adjust any cartridges unless specifically instructed by the manufacturer. Tampering with the cartridges will irrevocably alter pressure in the affected circuits.

c. Unloader Valve Installation

1. Place the unloader valve in its original orientation on the machine frame and secure with the previously used hardware. Torque capscrews to 31 lb-ft (42 Nm).
2. Uncap and connect the previously labeled hydraulic hoses to their appropriate locations.

Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

3. Check the routing of all hoses, wiring and tubing for sharp bends or interference with any rotating members.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Start the engine and run at approximately 1/3-1/2 throttle for about one minute without moving the machine or operating any hydraulic functions.
7. Inspect for leaks and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

8. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.



8.7.8 Outrigger Valve (10042 & 10054 only)

The outrigger valve allows the left and right outriggers to be raised or lowered depending on the position of the outrigger switches located on the side console in the cab.

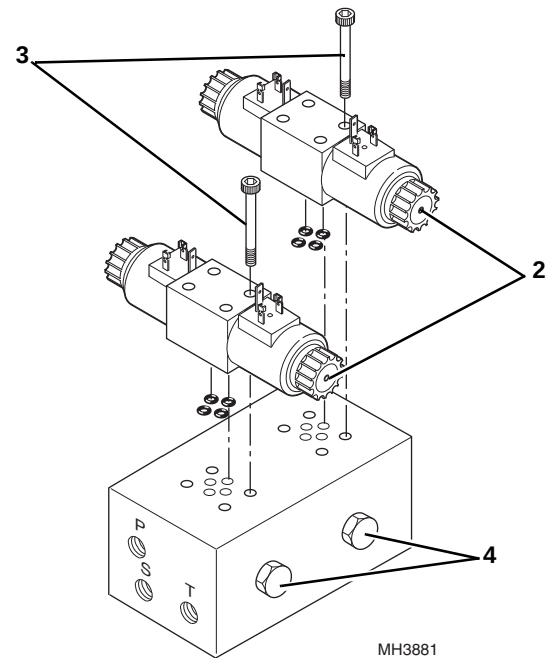
Verify the correct operation of the outrigger valve solenoids before considering replacement of the valve.

a. Outrigger Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. Properly disconnect the battery.
6. Remove the transmission covers.
7. Label, disconnect and cap the hydraulic hoses and the electrical plugs connected to the outrigger valve.
8. Remove the two flange nuts and two carriage bolts securing the outrigger valve to the frame. Remove the outrigger valve from the machine.
9. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.

b. Outrigger Valve Disassembly, Cleaning, Inspection and Assembly

1. Place the outrigger valve assembly on a suitable work surface.



2. Remove the solenoid valve assemblies (2) from the outrigger valve by removing the four capscrews (3). Discard the four o-rings.
3. Remove the shuttle cartridges (4) from the outrigger valve.
4. Clean all components with a suitable cleaner before inspection.
5. Inspect the solenoid cartridges for proper operation. Check by shifting the spool to ensure that it is functioning properly. Check that the spring is intact. Inspect the cartridge interior for contamination.
6. Inspect internal passageways of the outrigger valve for wear, damage, etc. If inner surfaces of the valve DO NOT display an ultra-smooth, polished finish, or components are damaged in any way, replace the valve or appropriate part. Often, dirty hydraulic fluid causes failure of internal seals and damage to the polished surfaces within the secondary function manifold.

Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

7. Install the shuttle cartridges into the outrigger valve. Torque to 35 lb-ft (48 Nm).
8. Attach the solenoid assemblies to the outrigger valve using four new, oiled o-rings and the previously used capscrews.



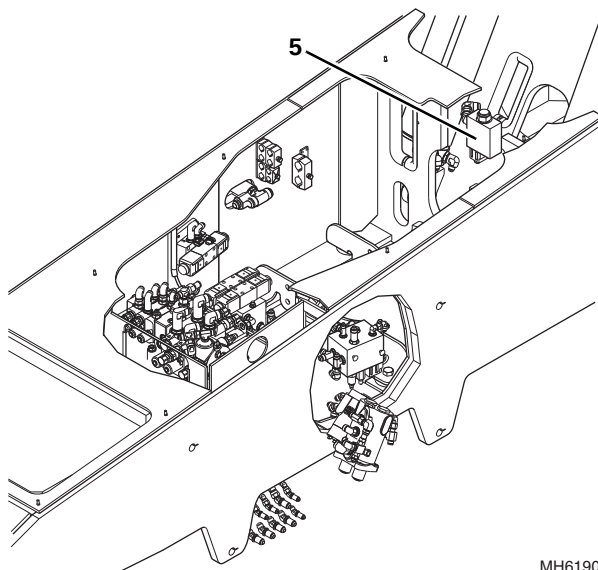
c. Outrigger Valve Installation

1. Insert the previously used bolts through the bottom of the outrigger valve and loosely attach the flange nuts to the carriage bolts.
2. Position the outrigger valve so that the heads of the carriage bolts go through the slots in the frame. Tighten the flange nuts.
3. Connect all the previously labeled hydraulic hoses, fittings, solenoid wire terminal leads, etc., to the outrigger valve.
4. Check the routing of all hoses and wiring for sharp bends or interference with any rotating members, and install tie wraps and/or protective conduit as required. Tighten all hose clamps.
5. Properly connect the battery.
6. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
7. Start the engine and run at approximately 1/3-1/2 throttle for about one minute without moving the machine or operating any hydraulic functions.
8. Inspect for leaks and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

9. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
10. Install the transmission covers.
11. Close and secure the rear door.

8.7.9 Extend Lockout Valve (10054 only)

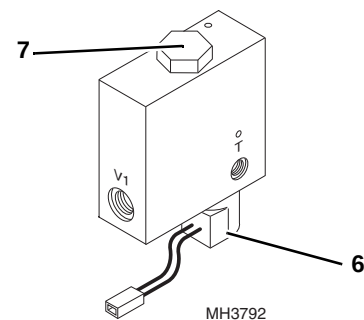


Model 10054 has an extend lockout valve (5) which prevents the boom from being extended beyond 42 feet unless the outriggers are lowered onto firm terrain. Once the outriggers are lowered, pressure switches located on each outrigger cylinder close and energize the solenoid on the boom extend lockout valve. The boom can then be fully extended.

a. Extend Lockout Valve Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Temporarily block up or support the raised boom.
4. Open the rear door. Allow the system fluids to cool.
5. Properly disconnect the battery.
6. Remove the transmission covers.
7. Label, disconnect and cap the hydraulic hoses and the electrical plugs connected to the extend lockout valve.
8. Remove the nut and bolt securing the extend lockout valve to the frame. Remove the valve from the machine.
9. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.

b. Extend Lockout Valve Disassembly, Cleaning, Inspection and Assembly



1. Secure the extend lockout valve assembly in a suitable bench vise if possible. Remove the solenoid nut, coil and cartridge (6) from the valve. Remove the pressure sense valve (7) from the valve.
2. Clean all components with a suitable cleaner before inspection.
3. Inspect the solenoid cartridge for proper operation. Check by shifting the spool to ensure that it is



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functioning properly. Check that the spring is intact. Inspect the cartridge interior for contamination.

4. Inspect internal passageways and the extend lockout valve overall for wear, damage, etc. If inner surfaces of the component DO NOT display an ultra-smooth, polished finish, or are damaged in any way, replace the extend lockout valve. Often, dirty hydraulic fluid causes failure of internal seals and damage to the polished surfaces within the valve.

Note: ALWAYS replace seals, o-rings, gaskets, etc., with new parts to help ensure proper sealing and operation. Lubricate seals and o-rings with clean hydraulic oil.

5. Install the solenoid valve.
6. Install the pressure sensing valve. Torque to 65 lb-ft (88 Nm).

c. Extend Lockout Valve Installation

1. Place the extend lockout valve into position on the mounting plate on the machine frame.
2. Install the bolt and nut securing the valve to the frame.
3. Connect all the previously labeled hydraulic hoses, fittings, solenoid wire terminal leads, etc., to the outrigger valve.
4. Check the routing of all hoses and wiring for sharp bends or interference with any rotating members, and install tie wraps and/or protective conduit as required. Tighten all hose clamps.
5. Properly connect the battery.
6. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
7. Start the engine and run at approximately 1/3-1/2 throttle for about one minute without moving the machine or operating any hydraulic functions.
8. Inspect for leaks and check the level of the hydraulic fluid in the reservoir. Shut the engine OFF.

Note: Check for leaks and repair as required before continuing. Add hydraulic fluid to the reservoir as needed.

9. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
10. Install the transmission covers.
11. Close and secure the rear door.

d. Extend Lockout Valve Test

Conduct a test of the extend lockout valve.

1. Park the machine on a firm, level surface.
2. With the boom fully retracted and lowered, lower the outriggers.
3. Extend the boom to 54 ft. The boom should extend fully and should not stop at 42 ft.

8.8 HYDRAULIC CYLINDERS

8.8.1 General Cylinder Instructions

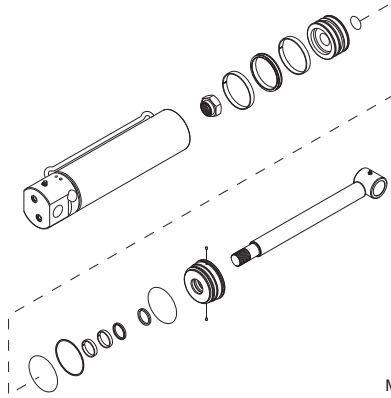
a. Cylinder Removal

1. Remove any attachment from the machine. Park the machine on a firm level surface and fully retract the boom. Allow sufficient work space around the hydraulic cylinder being removed. Support the boom if the lift/lower cylinder is being removed. Place the travel select lever in (N) NEUTRAL, engage the park brake, shut the engine OFF and chock wheels.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Label, disconnect and cap or plug hydraulic hoses in relation to the cylinder.
5. Attach a suitable sling to an appropriate lifting device and to the cylinder. Make sure the device used can actually support the cylinder.
6. Remove the lock bolt and/or any retaining clips securing the cylinder pins. Remove the cylinder pins.
7. Remove the cylinder.
8. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.



b. Cylinder Disassembly

1. Clean the cylinder with a suitable cleaner before disassembly. Remove all dirt, debris and grease from the cylinder.



2. Clamp the barrel end of the cylinder in a soft-jawed vise or other acceptable holding equipment if possible.



WARNING

Significant pressure may be trapped inside the cylinder. Exercise caution when removing a counterbalance valve or a pilot-operated check valve from a cylinder.

Note: Avoid using excessive force when clamping the cylinder in a vise. Apply only enough force to hold the cylinder securely. Excessive force can damage the cylinder tube.

3. If applicable, remove the counterbalance valve from the side of the cylinder barrel.

Note: DO NOT tamper with or attempt to adjust the counterbalance valve cartridge. If adjustment or replacement is necessary, replace the counterbalance valve with a new part.

4. Extend the rod as required to allow access to the base of the cylinder.

Note: Protect the finish of the rod at all times. Damage to the surface of the rod can cause seal failure.

5. Using a pin spanner wrench, unscrew the head gland from the tube. A considerable amount of force will be needed to remove the head gland. Carefully slide the head gland down along the rod toward the rod eye, away from the cylinder barrel.

Note: When sliding the rod and piston assembly out of the barrel, prevent the threaded end of the barrel from damaging the piston. Keep the rod centered within the barrel to help prevent binding.

6. Carefully pull the rod assembly along with the head gland out of the cylinder barrel.
7. Fasten the rod eye in a soft-jawed vise, and place a padded support under and near the threaded end of the rod to prevent any damage to the rod.
8. Remove the set screw from the piston head.

Note: It may be necessary to apply heat to break the bond of the sealant between the piston and the rod before the piston can be removed.

Some cylinder parts are sealed with a special organic sealant and locking compound. Before attempting to disassemble these parts, remove any accessible seals from the area of the bonded parts. Wipe off any hydraulic oil, then heat the part(s) uniformly to break the bond. A temperature of 300-400° F (149-204° C) will destroy the bond. Avoid overheating, or the parts may become distorted or damaged. Apply sufficient torque for removal while the parts are still hot. The sealant often leaves a white, powdery residue on threads and other parts, which must be removed by brushing with a soft brass wire brush prior to reassembly.

9. Remove the piston head from the rod and carefully slide the head gland off the end of the rod.
10. Remove all seals, back-up rings and o-rings from the piston head and all seals, back-up rings and o-rings from the head gland.

Note: The head gland bearing will need to be inspected to determine if replacement is necessary.

DO NOT attempt to salvage cylinder seals, sealing rings or o-rings. ALWAYS use a new, complete seal kit when rebuilding hydraulic components. Consult the parts catalog for ordering information.

c. Cylinder Cleaning Instructions

1. Discard all seals, back-up rings and o-rings. Replace with new items from seal kit to ensure proper cylinder function.
2. Clean all metal parts with an approved cleaning solvent such as trichlorethylene. Carefully clean cavities, grooves, threads, etc.

Note: If a white powdery residue is present on threads or parts, it can be removed by using a soft brass wire brush. Wipe clean with Loctite Cleaner prior to reassembly.



d. Cylinder Inspection

1. Inspect internal surfaces and all parts for wear, damage, etc. If the inner surface of the cylinder barrel does not display a smooth finish, or is scored or damaged in any way, replace the barrel.
2. Remove light scratches on the piston, head gland, rod or inner surface of the cylinder barrel with a 400-600 grit emery cloth. Use the emery cloth in a rotary motion to polish out and blend the scratch(es) into the surrounding surface.
3. Check the piston rod assembly for run-out. If the rod is bent, it must be replaced.

e. Cylinder Assembly Instructions

1. Use the proper tools for specific installation tasks. Clean tools are required for installation.
2. Install new seals, back-up rings and o-rings on the piston and new seals, back-up rings, o-rings and bearing on the head gland.

Note: The extend/retract cylinder has a spacer that **MUST** be installed over the rod **AFTER** the head gland and **BEFORE** the piston head.

3. Fasten the rod eye in a soft-jawed vise, and place a padded support under and near the threaded end of the rod to prevent any damage to the rod.

Note: Protect the finish on the cylinder rod at all times. Damage to the surface of the rod can cause seal failure.

4. Lubricate and slide the head gland over the cylinder rod. Install the piston head on to the end of the cylinder rod. Loctite® 243™ and install the set screw in the piston head. Refer to Section 8.8.4, "Cylinder Torque Specifications" for torque specifications for the piston head and the set screw.

Note: Avoid using excess force when clamping the cylinder barrel in a vise. Apply only enough force to hold the cylinder barrel securely. Excessive force can damage the cylinder barrel.

5. Place the cylinder barrel in a soft-jawed vise or other acceptable holding device.

Note: When sliding the rod and piston assembly into the cylinder barrel, prevent the threaded end of the cylinder barrel from damaging the piston head. Keep the cylinder rod centered within the barrel to prevent binding.

6. Carefully insert the cylinder rod assembly into the cylinder barrel.
7. Screw the head gland into the cylinder barrel and tighten with a spanner wrench. Refer to Section

8.8.4, "Cylinder Torque Specifications" for torque specifications for the head gland.

8. If applicable, install new counter balance valve into block on the cylinder barrel.

f. Cylinder Installation

1. Grease the bushings at the ends of the hydraulic cylinder. Using an appropriate sling, lift the cylinder into its mounting position.
2. Align cylinder bushing and install pin, lock bolt or retaining clip.
3. Connect the hydraulic hoses in relation to the labels or markings made during removal.
4. Before starting the machine, check fluid level of the hydraulic fluid reservoir and if necessary fill to full mark with Mobilfluid 424® (ISO 46).
5. Start the machine and run at low idle for about one minute. Slowly activate hydraulic cylinder function in both directions allowing cylinder to fill with hydraulic oil.
6. Inspect for leaks and check level of hydraulic fluid in reservoir. Add hydraulic fluid if needed. Shut the engine OFF.
7. Wipe up any hydraulic fluid spillage in, on, near and around the machine, work area and tools.
8. Close and secure the rear door.

8.8.2 Cylinder Pressure Checking

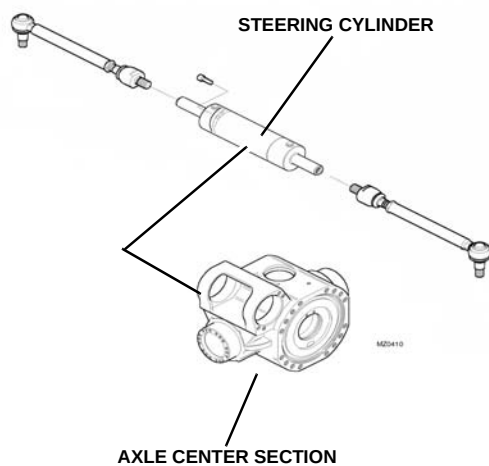
Attach a 4000 psi (276 bar) gauge to the test port on the hydraulic pump to check the system pressure. For more information, refer to Section 8.3.1, "Pressure Checks and Adjustments."

Note: If a hydraulic cylinder pressure is greater than the main control valve pressure, increase the main control valve pressure by adjusting the main relief. Generally, one half turn clockwise will be adequate to check an individual circuit. Activate the circuit and if pressure is obtained turn the main relief counter clockwise one half turn. Re-check the main relief setting and adjust if necessary.



8.8.3 Steering Cylinders

The steer cylinder is attached to each axle center housing. The steer cylinder assembly can be found in Section 5.4, "Axle Assemblies." The steer cylinder is covered in the appropriate manufacturer's axle literature.





8.8.4 Cylinder Torque Specifications

a. Lift/Lower Cylinder

Model	Nut	Valve	Locking Collar
6036, 6042	1750-2000 lb-ft (2373-2712 Nm)	30-35 lb-ft (41-47 Nm)	300-400 lb-ft (407-542 Nm)
8042, 10042, 10054	1735-1885 lb-ft (2352-2556 Nm)	30-35 lb-ft (41-47 Nm)	300-400 lb-ft (407-542 Nm)

b. Extend/Retract Cylinder

Model	Head	Piston	Valve	Set Screw
6036	300-400 lb-ft (407-542 Nm)	300-400 lb-ft (407-542 Nm)	45-50 lb-ft (61-68 Nm)	12-13 lb-ft (18-19 Nm)
6042	300-400 lb-ft (407-542 Nm)	330-390 lb-ft (447-529 Nm)	40-50 lb-ft (54-67 Nm)	10-26 lb-ft (13-35 Nm)
8042, 10042, 10054	300-400 lb-ft (407-542 Nm)	390-460 lb-ft (529-624 Nm)	150-160 lb-ft (1203-217 Nm)	9-11 lb-ft (12-15 Nm)

c. Tilt Cylinder

Model	Head	Piston	Locknut	Locking Collar	Valve	Set Screw
6036, 6042	300-400 lb-ft (407-542 Nm)	200-300 lb-ft (271-407 Nm)	N/A	N/A	30-35 lb-ft (41-47 Nm)	30-35 lb-ft (41-48 Nm)
8042, 10042, 10054	N/A	N/A	1735-1885 lb-ft (2352-2556 Nm)	300-400 lb-ft (407-542 Nm)	30-35 lb-ft (41-47 Nm)	N/A

d. Sway Cylinder

Head	Locknut	Valve
300-400 lb-ft (407-542 Nm)	1100-1250 lb-ft (1491-1695 Nm)	35-40 lb-ft (47-54 Nm)

e. Stabil-TRAK Cylinder

Model	Locknut	Check Valve	Guide	Set Screw	Pressure Reducing/ PO Check Valve	Solenoid Coil
6042	1175-1400 lb-ft (1593-1898 Nm)	20-25 lb-ft (27-34 Nm)	300-350 lb-ft (407-475 Nm)	3-4 lb-ft (4-5 Nm)	35-40 lb-ft (47-54 Nm)	25-30 lb-ft (34-41 Nm)
8042, 10042, 10054	N/A	20-25 lb-ft (27-34 Nm)	300-350 lb-ft (407-475 Nm)	3-4 lb-ft (4-5 Nm)	35-40 lb-ft (47-54 Nm)	25-30 lb-ft (34-41 Nm)

**f. Slave Cylinder**

Model	Head	Locknut	Set Screw
6036	250-300 lb-ft (339-407 Nm)	675-750 lb-ft (915-1017 Nm)	N/A
6042	300-350 lb-ft (407-475 Nm)	650-700 lb-ft (881-949 Nm)	3-4 lb-ft (4-5 Nm)
8042, 10042, 10054	300-400 lb-ft (407-542 Nm)	900-1050 lb-ft (1220-1424 Nm)	N/A

g. Swing Carriage Cylinder (If Equipped)

Model	Piston	Head	Set Screw	Valves
6036, 6042	440-500 lb-ft (597-678 Nm)	250-350 lb-ft (339-474 Nm)	85-95 lb-ft (115-129 Nm)	30-35 lb-ft (41-47 Nm)
8042, 10042, 10054	N/A	250-350 lb-ft (339-474 Nm)	85-95 lb-ft (115-129 Nm)	30-35 lb-ft (41-47 Nm)

h. Side Tilt Carriage Cylinder (If Equipped)

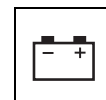
Head	Locknut	Valve
300-400 lb-ft (407-542 Nm)	550-650 lb-ft (745-881 Nm)	30-35 lb-ft (41-47 Nm)

i. Outrigger Cylinder

Model	Head	Locknut	Valves
10042, 10054	250-350 lb-ft (339-474 Nm)	1650-1800 lb-ft (2237-2440 Nm)	30-35 lb-ft (41-47 Nm)



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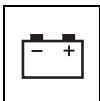


Section 9

Electrical System

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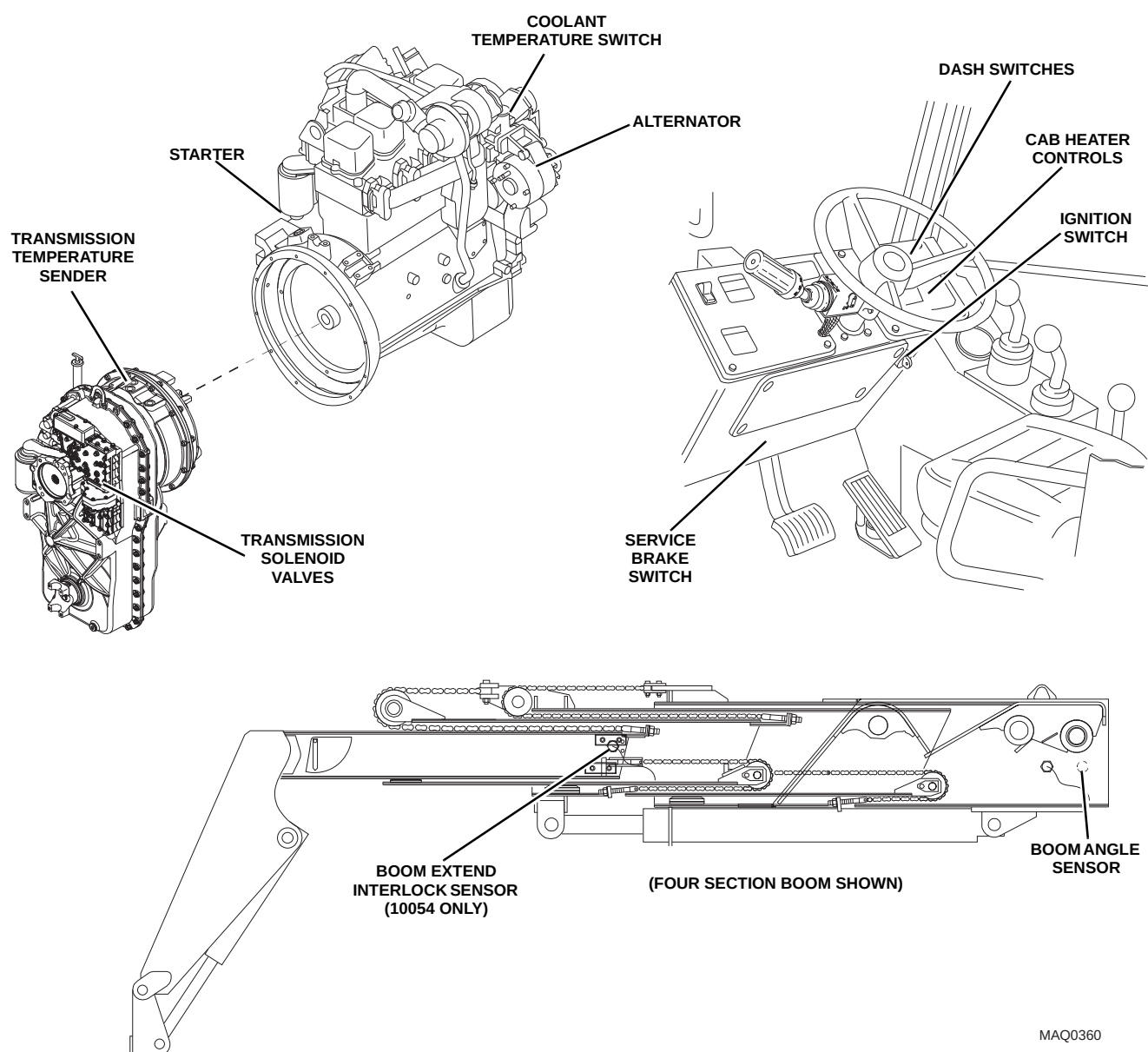


Electrical System

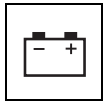
9.1 ELECTRICAL COMPONENT TERMINOLOGY

To understand the safety, operation, and service information presented in this section, it is necessary that the operator/mechanic be familiar with the name and location of the electrical components of the machine. The following illustration identifies the components that are referred to throughout this section.

9.1.1 General Overview



MAQ0360



9.2 SPECIFICATIONS

Electrical system specifications are listed in Section 2, "General Information and Specifications."

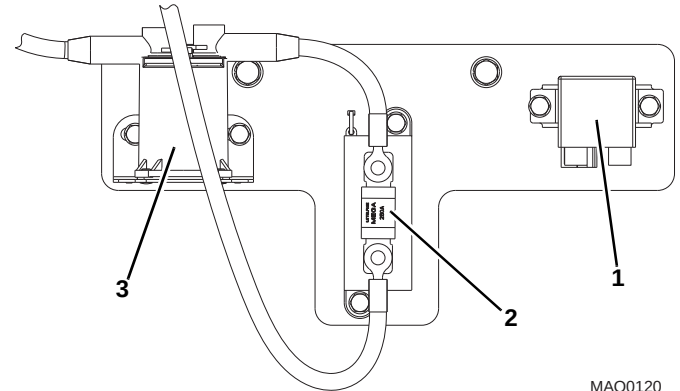
9.3 SAFETY INFORMATION

WARNING

DO NOT service the machine without following all safety precautions as outlined in Section 1, "Safety Practices," of this manual.

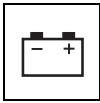
9.4 FUSES AND RELAYS

9.4.1 Engine Compartment



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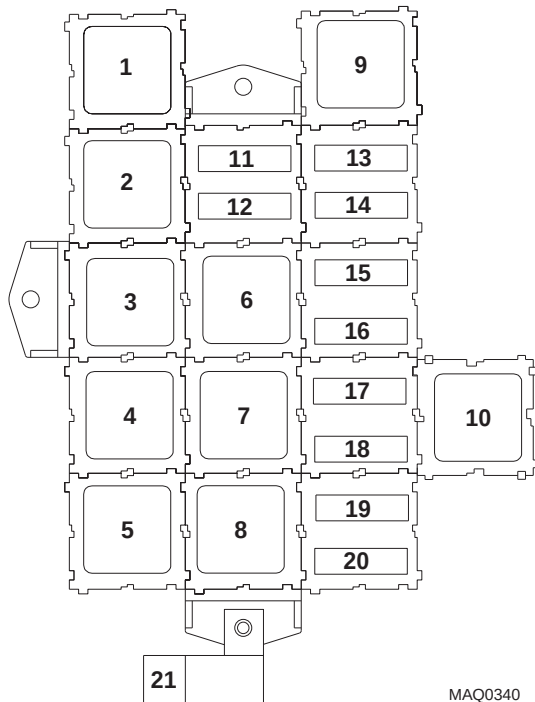
The starter relay (1), one 250 amp fuse (2) and one 200 amp relay (3) for the cold start grid heater (if equipped) are located inside the engine compartment and are mounted on a bracket on the left side of the frame rail.



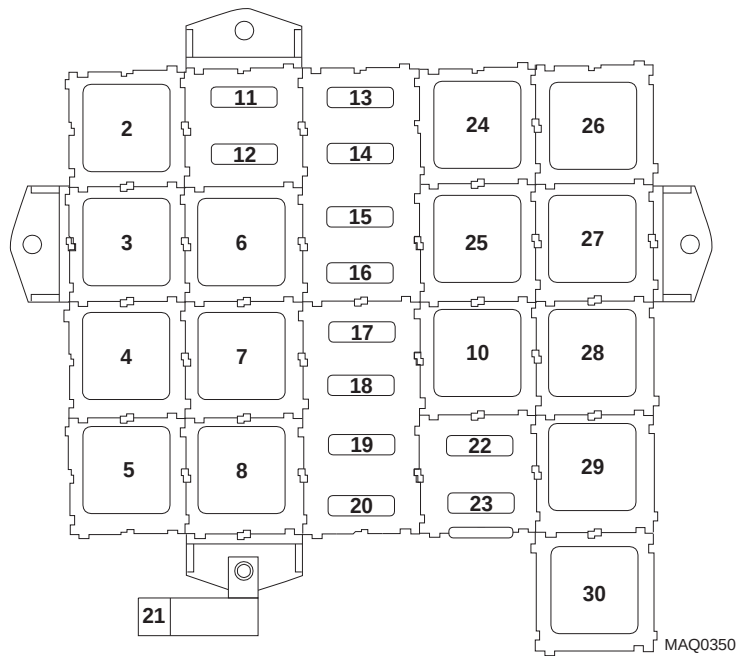
Electrical System

9.4.2 Cab Harness Fuses and Relays

6036, 6042, 8042 & 10042



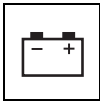
10054



No.	Volt/ Amp	Circuit
1	12 Volt	Oil Temperature
2	12 Volt	Headlight Switch
3	12 Volt	Light Switch
4	12 Volt	Stabilizer Lock
5	12 Volt	Boom Switch
6	12 Volt	Park Brake Disengage
7	12 Volt	Neutral Start
8	12 Volt	Back up
9	12 Volt	Water Temperature
10	12 Volt	Ignition
11	7.5 Amp	Transmission
12	20 Amp	Lights
13	15 Amp	Horn/Heater
14	10 Amp	Wiper (if equipped)
15	10 Amp	Stabilizer
16	10 Amp	Steer Select
17	7.5 Amp	Optional Cab/ Outrigger (if equipped)
18	10 Amp	Park Brake
19	7.5 Amp	Optional
20	40 Amp	Main

No.	Volt/ Amp	Circuit
21	40 Amp	Road/Worklights (if equipped)
22	7.5 Amp	Outrigger
23	7.5 Amp	Outrigger
24	12 Volt	Park Brake Interlock
25	12 Volt	Boom Extend Lockout
26	12 Volt	Stabil-TRAK Interlock
27	12 Volt	Stabil-TRAK Lock Up
28	12 Volt	Boom Extend Interlock
29	12 Volt	Right Outrigger Lock
30	12 Volt	Left Outrigger Lock

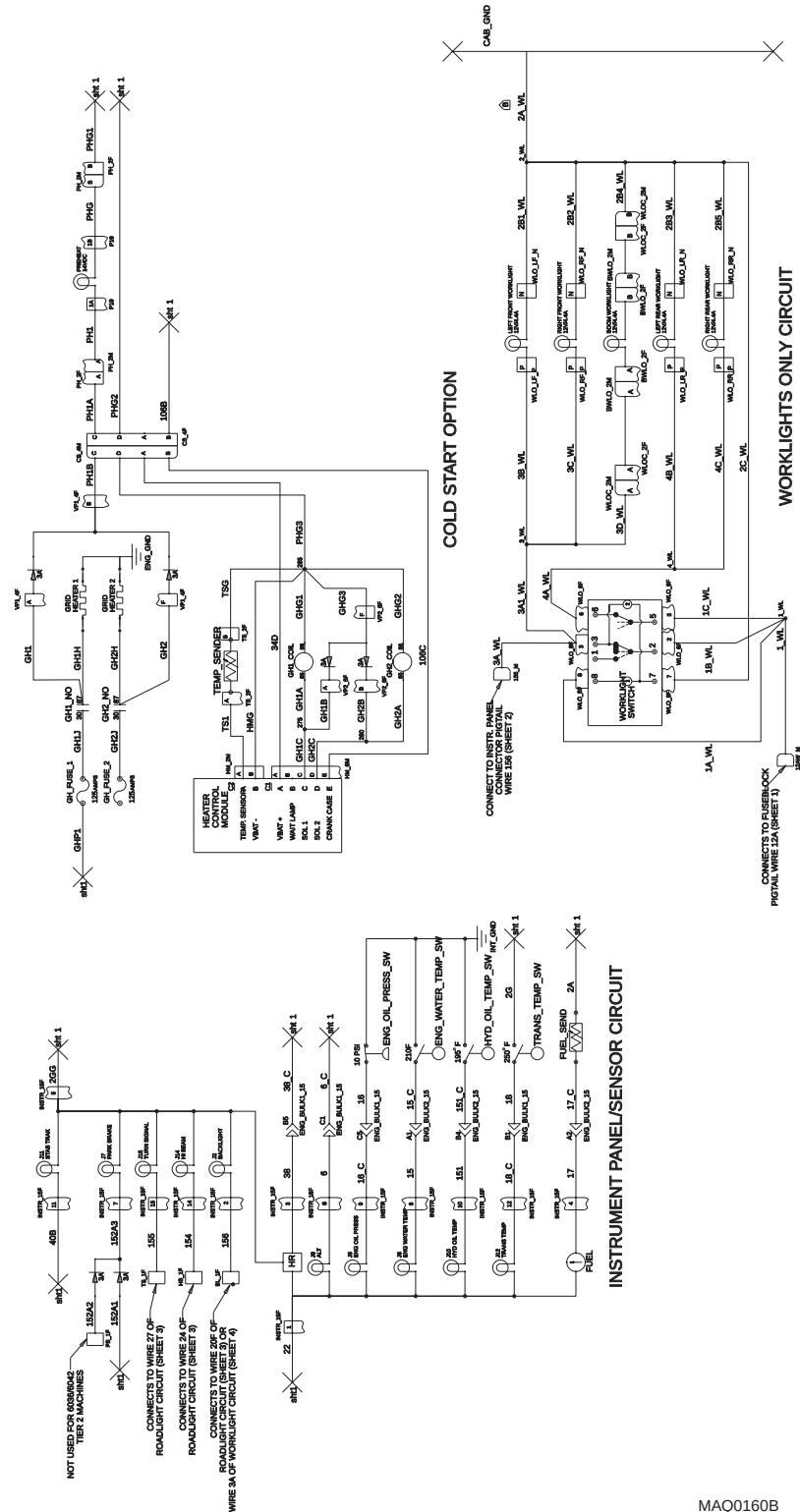
The following Ladder Diagrams may be used to further investigate electrical circuits. If a resolution cannot be found contact your local authorized service distributor



Electrical System

9.5.1 6036 & 6042 Electrical Schematic (Continued)

6036 & 6042

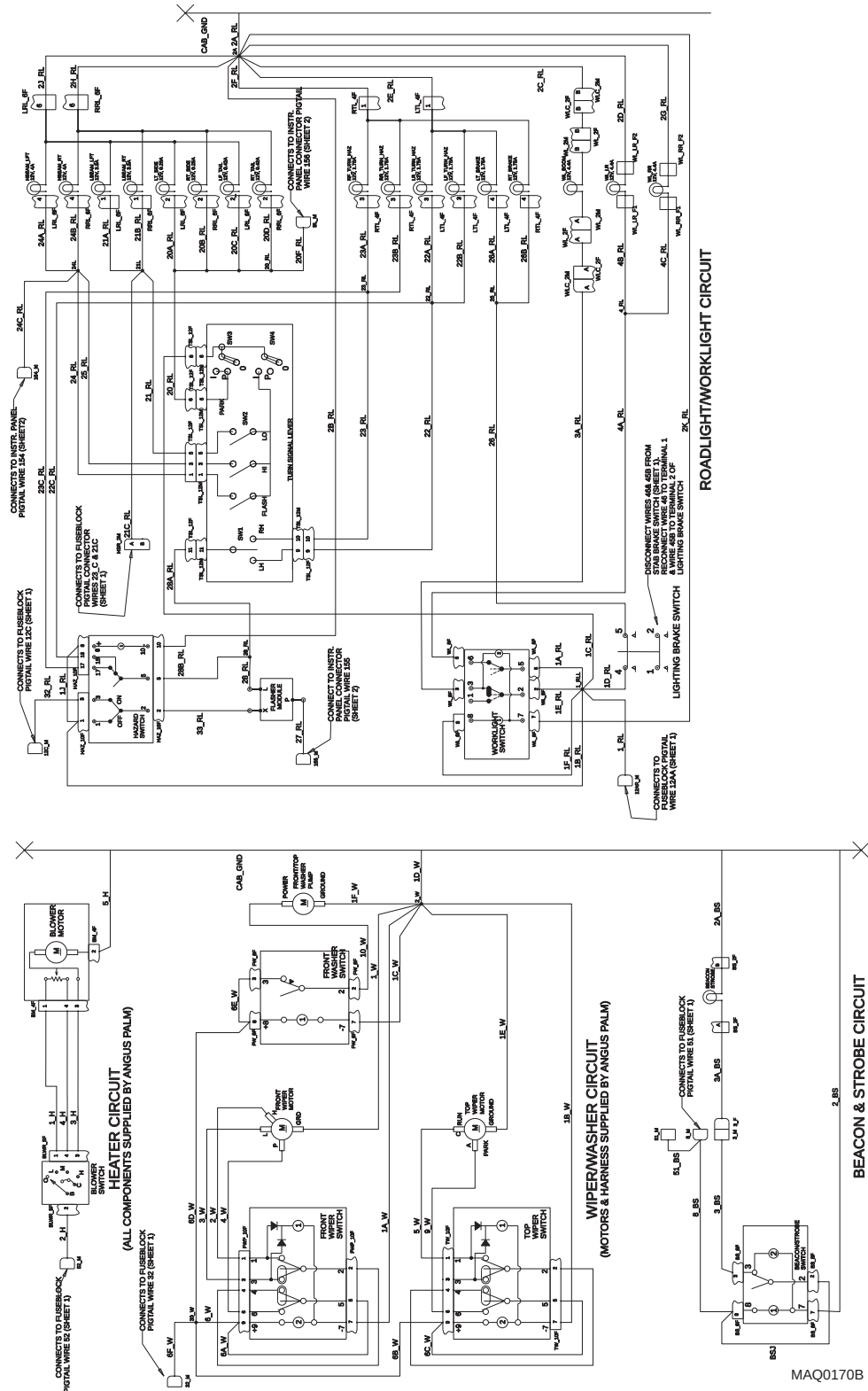


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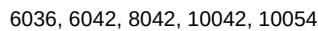
9.5.1 6036 & 6042 Electrical Schematic (Continued)

6036 & 6042





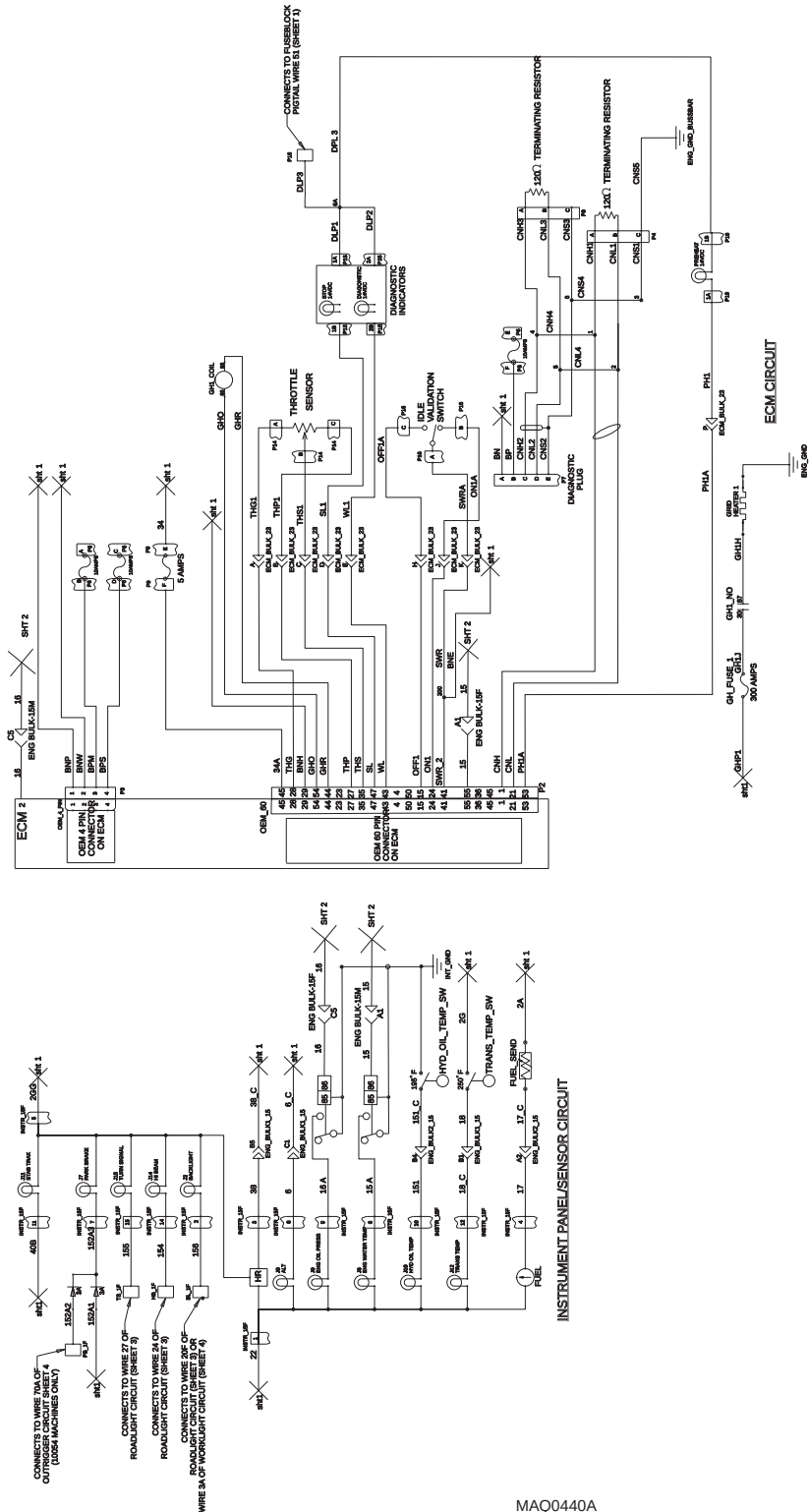
9-8





9.5.2 8042, 10042 & 10054 Electrical Schematic (Continued)

8042, 10042 & 10054



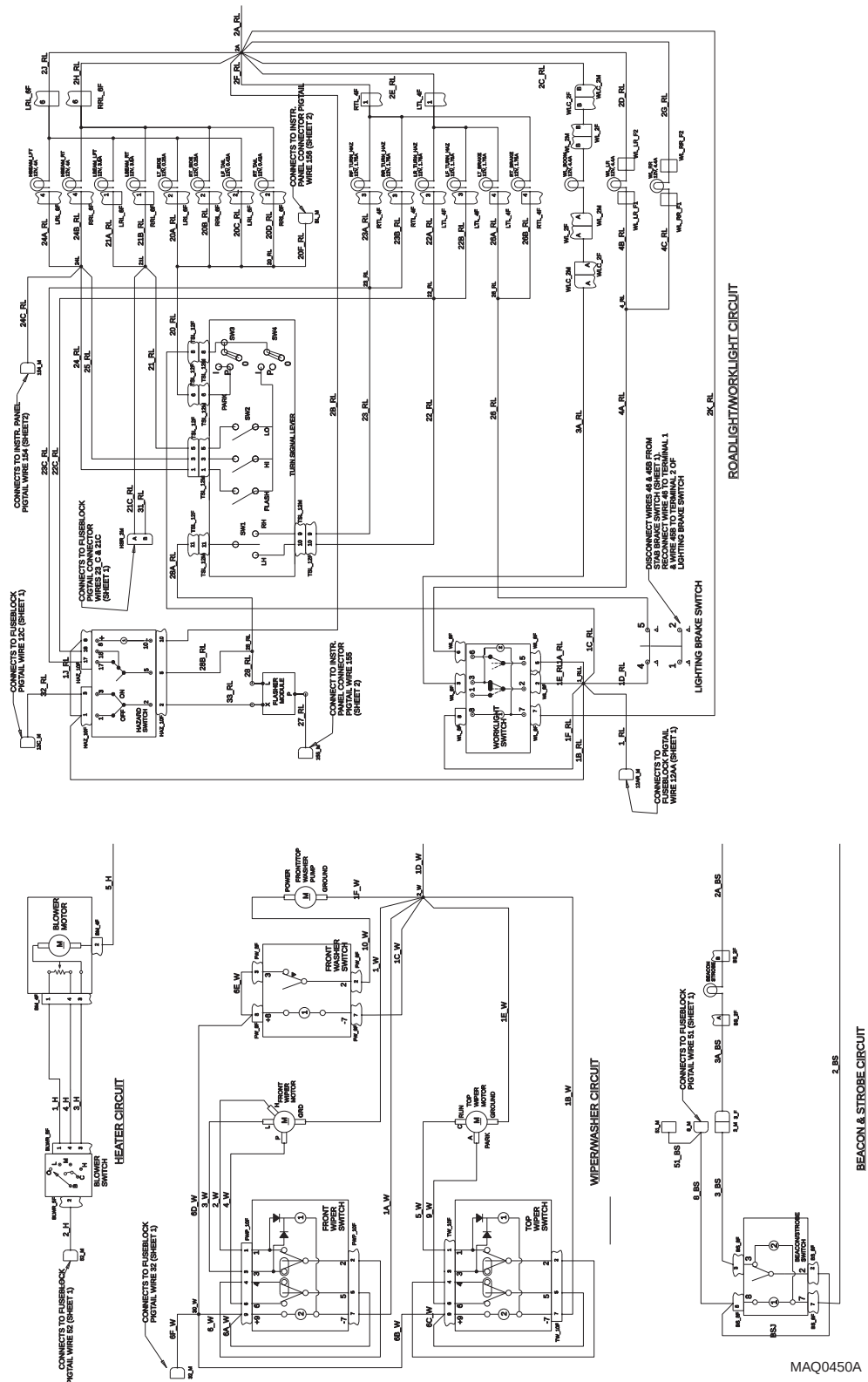
MAQ0440A



Electrical System

9.5.2 8042, 10042 & 10054 Electrical Schematic (Continued)

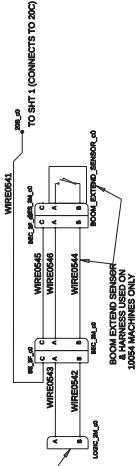
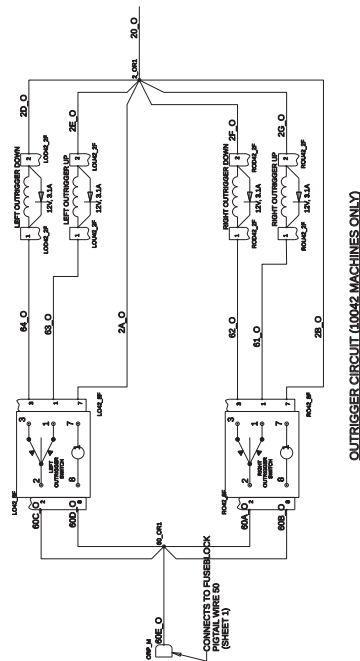
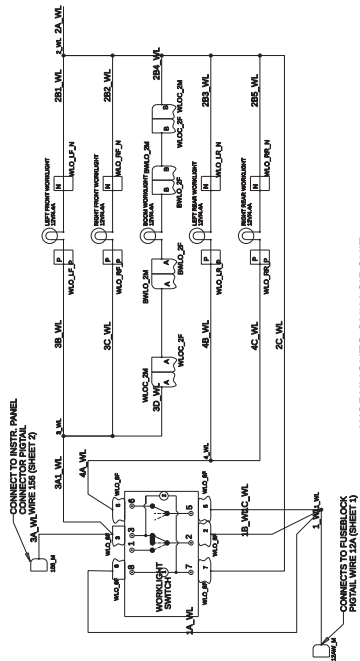
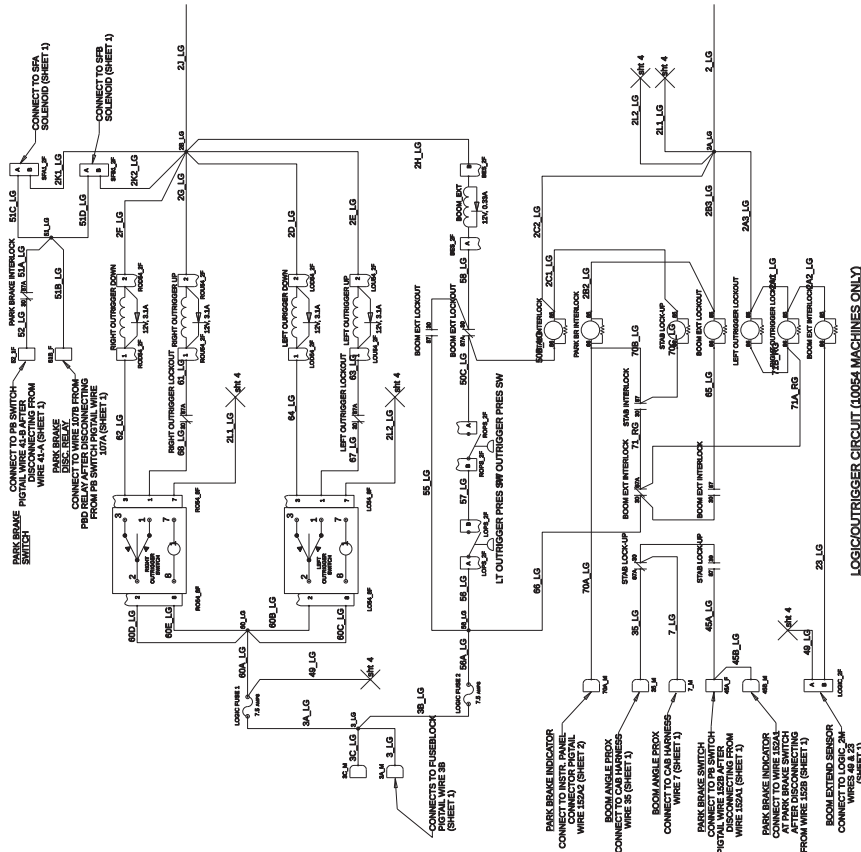
8042, 10042 & 10054





9.5.2 8042, 10042 & 10054 Electrical Schematic (Continued)

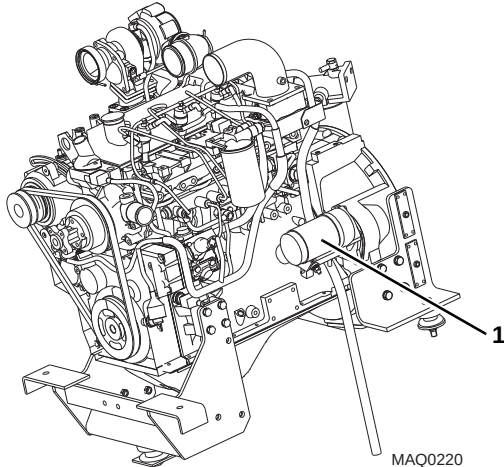
8042, 10042 & 10054





9.6 ENGINE START CIRCUIT

9.6.1 Starter



MAQ0220

The starter (1) is located on the left side of the engine.

a. Testing the Starter on the Engine

If the starter does not engage when the ignition key switch is turned, check the following:

1. The main fuse may be blown, requiring replacement. Check for the cause of the blown fuse.
2. There may be a defect in the ignition key switch, ignition wiring or starter solenoid.
3. Check battery condition. Clean the battery posts and the connectors at each end of the battery cables.
4. Check for broken wiring and damaged insulation on the wiring. Replace all broken or damaged wiring.
5. Check all connections at the starter solenoid, key switch and wiring harness plugs. Clean and tighten all connections.
6. If the starter still does not operate after these checks have been performed, check the starting circuit.

b. Starter Circuit Checks

1. Check wires and connections for looseness, corrosion, damage, etc.
2. If a “whirring” noise is heard but the engine does not turn over, the starter is spinning but not engaging the flywheel. The starter drive or solenoid that pushes the drive forward to engage the flywheel may be defective. Missing or damaged teeth on the flywheel can also prevent the starter from cranking the engine.

3. If the starter only “clicks” it may indicate that the battery is discharged, or that there is a loose or corroded battery cable connection. Check the battery state of charge and battery condition first, then check the cables and cable connections.
4. For additional information on the starting circuit, refer to Section 9.5, “Electrical System Schematics.”

c. Starter Removal

Remove the starter only if it fails. To remove the starter:

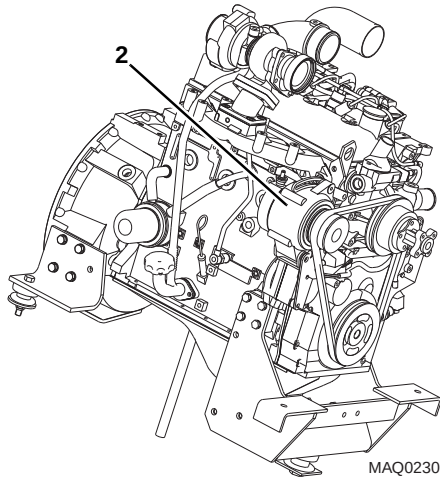
1. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
2. Open the rear and side engine covers. Allow the system fluids to cool.
3. Properly disconnect the battery.
4. Remove the wires from the solenoid stud. Remove the positive (+) battery cable from the starter. Label and disconnect the wire from the starter solenoid housing stud. Record how the wires are installed to ensure correct installation later.
5. Loosen, but DO NOT remove, the fasteners securing the starter to the flywheel housing. Support the starter securely, as it is relatively heavy and will fall if not supported.
6. Support the starter and remove the fasteners securing the starter to the engine. Remove the negative (-) ground cable from its starter mounting bolt.
7. Remove the starter from the machine.

d. Starter Installation

1. Position the starter in its mounting opening on the flywheel housing. Position the ground cable over the correct starter mounting bolt. Secure the starter with the previously used hardware.
2. Connect the positive (+) battery cable to the upper solenoid stud. Install the wires to the upper solenoid stud, and secure with lock washer and nut.
3. Connect the wire to the solenoid mounting stud.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Close and secure the rear and side engine covers.



9.7 CHARGING CIRCUIT



Before using a battery charger, an attempt can be made to recharge the battery by jump-starting the machine (Refer to the appropriate Operation & Safety Manual). Allow the engine to run, which will enable the alternator (2) to charge the battery.

If the engine alternator charging warning indicator illuminates, perform the following checks:

1. Check all battery cable connections at the battery, and verify that they are clean and tight.
2. Check the external alternator wiring and connections, and verify that they are in good condition.
3. Check the fan belt condition and tension.
4. Run the engine and check the alternator for noise. A loose drive pulley, loose mounting hardware, worn or dirty internal alternator bearings, a defective stator or defective diodes can cause noise. Replace a worn or defective alternator.

9.7.1 Alternator

a. Alternator Removal

1. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
2. Open the rear and side engine covers. Allow the system fluids to cool.
3. Properly disconnect the battery.
4. Install a drive ratchet into the square hole in the serpentine belt tensioner bracket.
5. While lifting the automatic belt tensioner away from the belt, remove the fan serpentine belt.

Note: Record how the alternator is installed to ensure correct installation later.

6. Label and disconnect the wire leads attached to the alternator.
7. Remove the lower mounting capscrew securing the alternator to the lower mounting hole on the engine.
8. While supporting the alternator with one hand, remove the upper (longer) mounting hardware from the upper alternator mount. Remove the alternator from the machine.

b. Alternator Installation

1. Position the alternator and align with the upper alternator mount on the engine bracket. Insert the upper (longer) mounting hardware through the alternator mount. Thread the longer capscrew into the alternator front mount. DO NOT tighten completely at this time.
2. Align the lower alternator mount hole with the lower mounting bracket on the engine, and insert the lower mounting capscrew. Tighten the lower capscrew and upper capscrew securely.
3. Place a drive ratchet into the square hole on the serpentine belt tensioner bracket. Apply pressure against the tensioner bracket and route the serpentine belt onto the alternator and engine pulleys. Release and check the tensioner pulley to verify that it is pivoting freely in order to provide the proper tension on the belt. Check for proper belt alignment. (Refer to the appropriate Operation & Safety Manual.)
4. Connect the previously labeled wire leads to the alternator.
5. Properly connect the battery.
6. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
7. Close and secure the rear and side engine covers.



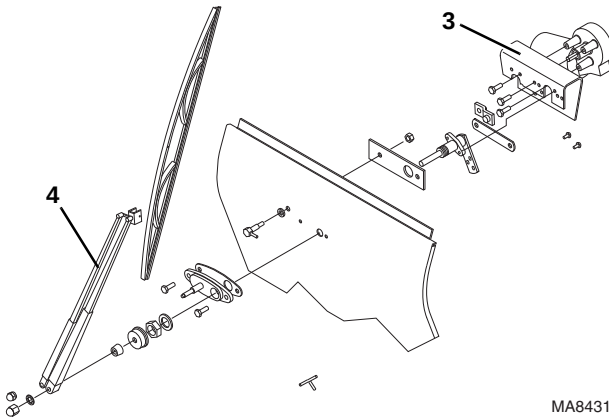
9.8 WINDOW WIPER/WASHER WINDSHIELD WIPER MOTOR

9.8.1 Windshield Wiper Motor

a. Removal

Note: It may be necessary to remove several hydraulic hoses from behind the dash in order to remove and install the wiper motor housing. (Refer to Section 4.3.1, "Steering Column and Steering Valve.")

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the right side instrument panel.
6. Remove the lower access panel below the instrument panel.
7. Disconnect the right side defroster hose from the dash panel hose connector.



8. Disconnect the cab harness connectors from the wiper motor (3).
9. From the outside and front of the cab, remove the windshield wiper blade arm (4) nuts and washer from the motor shaft.
10. Disconnect the washer hose from the hose connector.
11. Remove the wiper arms, knurled driver and rubber cap from the motor shaft.

12. Remove the metal hex jam nut and metal washer from the motor shaft.
13. Remove the motor mounting bolts, panto adapter and gasket from the motor shaft.

Note: Retain all hardware removed from the wiper assembly for possible reuse on the replacement motor housing.

14. Remove the motor from the inside of the cab.

b. Disassembly

DO NOT disassemble the motor. The motor is not serviceable. Replace motor if found to be defective.

c. Inspection and Replacement

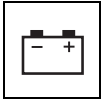
Inspect the motor terminals for continuity. Replace motor if continuity is not found.

d. Installation and Testing

1. Install all required hardware to the motor assembly. Align spacer and wiper motor bracket, and apply masking tape in order to hold the two components together during installation.
2. Align motor with the mounting holes and insert motor through cab.
3. Have an assistant insert gasket, panto adapter onto the motor shaft. Insert bolts through front cab holes and thread into motor housing. Tighten bolts.
4. Install metal washer and metal hex jam nut. Tighten metal hex jam nut. Install rubber cap and knurled driver onto the motor shaft.

Note: Align the wiper blade arm with the hex jam nut. Tighten shaft to ensure wiper stroke covers window area, and it does not swipe past the glass area.

5. Install wiper blade arm at 90° from the motor shaft flat.
6. Connect the cab harness connectors to windshield wiper motor connectors.
7. Properly connect the battery.
8. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.

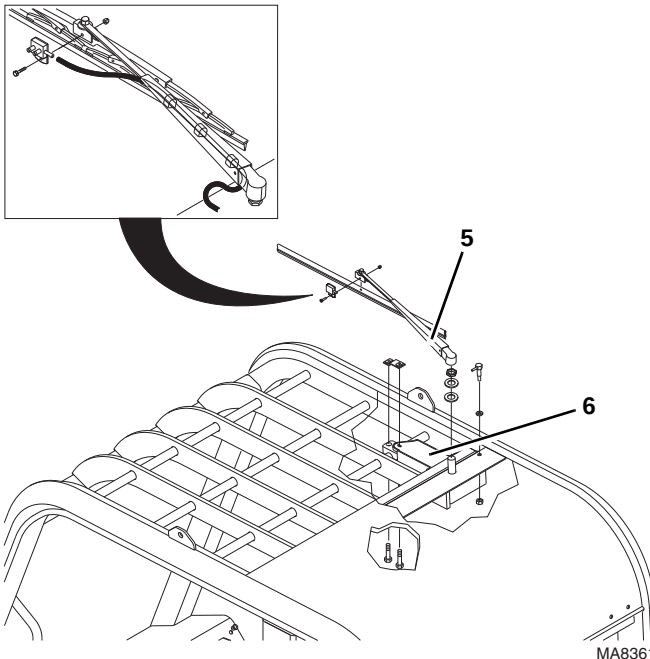


9. Turn ignition key switch to the RUN position, and operate windshield wiper in both LOW and HIGH speeds to ensure proper operation and that correct wiper travel is achieved.
10. If previously removed, install hydraulic hoses under the dash. (Refer to Section 4.3.1, "Steering Column and Steering Valve.")
11. Install the previously removed dash panels.
12. Close and secure the rear door.

9.8.2 Skylight Wiper Motor

a. Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. Remove the wiper arm (5) from the wiper motor shaft.
6. Disconnect the washer hose from the top hose fitting.
7. From inside the cab, remove screws from top locknut plate.

8. Unclip the plastic motor cover (6) and remove.
9. From the top of the cab, remove the nut from the wiper motor shaft.
10. From inside the cab, pull the wiper motor down and away from the roof.
11. Label and disconnect the cab harness connectors from the wiper motor.

b. Disassembly

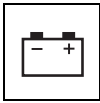
DO NOT disassemble the motor. The motor is not serviceable. Replace motor if found to be defective.

c. Inspection and Replacement

Inspect the motor terminals for continuity. Replace motor if continuity is not found.

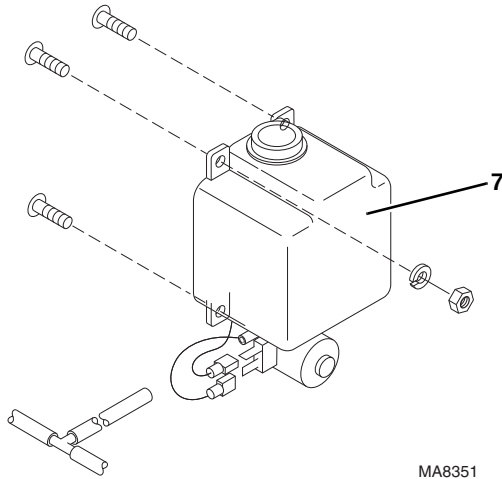
d. Installation and Testing

1. Hold wiper motor up toward cab top and install the cab harness connectors.
2. With the help of an assistant, insert the wiper motor through the roof hole and have the assistant thread the nut onto the wiper motor shaft. Ensure that the motor housing is facing the front of the cab.
3. Install the wiper arm onto the wiper motor shaft.
4. Install the screws through the plastic motor cover and into the top locknut plate and tighten.
5. Connect washer hose to top hose fitting.
6. Properly connect the battery.
7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
8. Turn the ignition key to the RUN position and turn skylight wiper switch to the ON position. Ensure wiper stays on the window through a full stroke. Turn the skylight wiper switch to the OFF position.
9. Engage the washer switch and ensure washer fluid is sprayed on the skylight window. Turn the ignition key switch to the OFF position.
10. Close and secure the rear door.



Electrical System

9.8.3 Windshield Washer Reservoir



The windshield washer motor and reservoir (7) is a unit and cannot be serviced separately.

a. Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the nuts and the lock washers from the washer mounting bolts.
6. Pull the washer reservoir out and away from the mounting bracket.
7. Rotate the washer reservoir, label and remove the cab harness connectors from the washer reservoir connectors.
8. Remove the windshield washer hose from the reservoir.

b. Disassembly

DO NOT disassemble the pump. The pump is not serviceable. Replace pump if found to be defective.

c. Installation and Testing

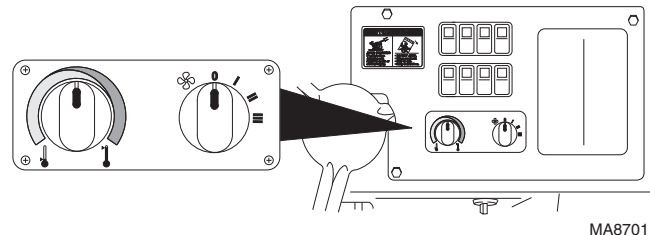
1. Connect the windshield washer hoses to the reservoir.
2. Connect the cab wiring harness connectors to the reservoir connectors.
3. Install the reservoir tank onto the welded studs.
4. Install the lock washers and nuts and secure.
5. Fill the washer fluid reservoir with washer fluid.
6. Properly connect the battery.
7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
8. Turn the ignition key switch to the RUN position and press the washer switch. Verify that fluid is sprayed on both the windshield and rear glass.
9. Close and secure the rear door.

9.9 CAB HEATER AND FAN

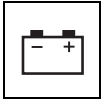
9.9.1 Cab Heater Controls

Note: If the suspect component is found to be within the heater box, the heater box must be removed as a complete unit and replaced.

a. Cab Heater Controls Removal



1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the setscrew from the variable speed fan control knob or temperature control knob.
6. Remove the right side control panel screws.
7. Remove the screws and backing locknuts from the cab heater and fan control panel.



8. Pull the control panel out from the dash panel, and if removing variable speed fan control, remove the cab harness connector.
9. If removing the temperature control knob, disconnect the cable connector and remove control knob.
10. Remove the locknut from the suspect control shaft.
11. Remove the control panel from the panel.

b. Disassembly

DO NOT disassemble the cab heater and fan controls. The controls are not serviceable. Replace controls if found to be defective.

c. Installation and Testing

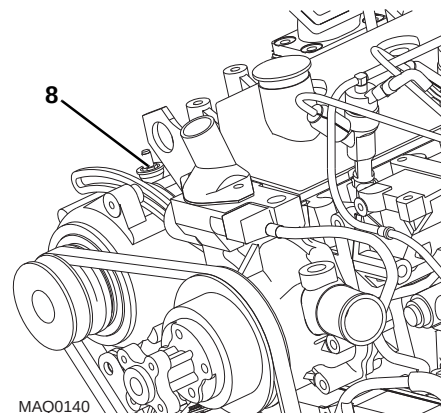
1. Check that the variable speed fan control is in the OFF position.
2. If installing the temperature control, attach the control cable to the back of the control.
3. Insert the control shaft through the panel, ensuring that the knob is in the VERTICAL position.
4. Install the locknut on the shaft and tighten.
5. Connect the cab harness connector to the variable speed fan control.
6. Install the screws and backing locknuts securing the control panel to the dash panel.
7. Install the setscrew securing the knob to the control.
8. Install the right side control panel.
9. Properly connect the battery.
10. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
11. Turn the ignition key to the ON position and check the fan speeds. If further repair is needed, refer to Section 9.5, "Electrical System Schematics."
12. Start the machine and allow engine to warm to operating temperature. Check heat control at different levels.
13. Close and secure the rear door.

9.10 SOLENOIDS, SENSORS AND SENDERS

9.10.1 Coolant Temperature Switch

a. Coolant Temperature Switch Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Temporarily block up or support the boom.
5. Properly disconnect the battery.



6. Label and disconnect the wiring connector from the Coolant Temperature Switch (8).
7. Unthread the switch from the engine.

b. Coolant Temperature Switch Disassembly

DO NOT disassemble the Coolant Temperature Switch. Replace a defective switch with a new part.

c. Coolant Temperature Switch Installation

1. Thread the switch into the engine. Tighten securely.
2. Connect the previously labeled wiring connector to the switch.
3. Properly connect the battery.
4. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.



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5. Start the engine. Allow it to reach operating temperature and observe the operator instrument cluster for warning indication. If the switch is not defective, the problem could be elsewhere; possibly in a shorted wire, improper running engine, improper or low coolant, obstructed or faulty radiator, coolant pump, loose fan belt, defective instrument cluster, etc.
6. Close and secure the rear door.

9.10.2 Hydraulic Oil Temperature Switch

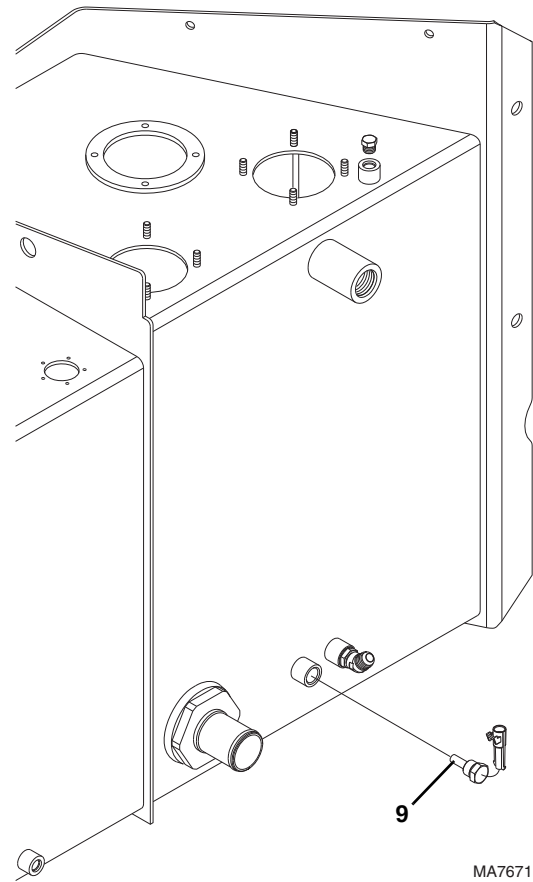
The hydraulic oil temperature switch (9) is threaded into a fitting at the lower inside wall of the hydraulic oil tank.

a. Hydraulic Oil Temperature Switch Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Drain oil from the hydraulic tank reservoir into a clean container for reuse.
6. Label and disconnect the temperature switch wiring connector from the harness connector.
7. Unthread the switch from the hydraulic reservoir.

b. Disassembly

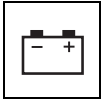
DO NOT disassemble the switch. The switch is not serviceable. Replace switch if found to be defective.



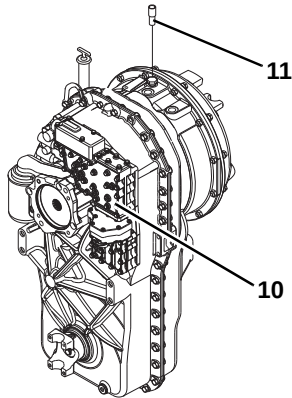
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c. Hydraulic Oil Temperature Switch Installation

1. Thread the switch into its fitting on the hydraulic reservoir. Tighten securely.
2. Fill hydraulic oil reservoir with hydraulic oil.
3. Connect the switch wiring connector to the harness connector.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Start the engine, check for hydraulic fluid leaking at the hydraulic oil temperature switch and allow the hydraulic fluid to reach operating temperature. Cycle the boom several times and check whether the hydraulic oil temperature warning indicator illuminates on the operator display panel.



9.10.3 Transmission Solenoid Valves



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Note: If the transmission is not shifting properly, the transmission shift control switch (travel select lever), wiring harness or transmission shift solenoids (**10**) should be checked in order to determine which component is defective. Specific information to determine which travel position and corresponding component is not responding can be found in the detailed transmission service instructions (covering repair, disassembly, reassembly and adjustment information) are provided in the ZF 4 WG-98 TC Repair Manual P/N 5871 135 002 (JLG P/N 8990455). and can be obtained by calling your local Authorized Service Department.

The transmission should be checked, serviced and repaired only by experienced service technicians who are aware of all safety instructions and particular component features.

Note: Contact your local authorized Service Department if internal transmission repair is required during the warranty period.

9.10.4 Transmission Temperature Sender

a. Transmission Temperature Sender Removal

The transmission temperature sender (**11**) is threaded into the top of the transmission housing.

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, raise the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Properly disconnect the battery.
4. Temporarily block up or support the boom.

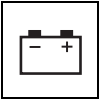
5. Open the rear door. Allow the system fluids to cool.
6. Remove the transmission covers.
7. Unplug the transmission temperature sender connector from the wiring harness connector.
8. The sender is threaded into the transmission housing. Remove the sender.

b. Transmission Temperature Sender Inspection and Replacement

Inspect the sender and the wiring harness connector terminals for continuity. Replace a defective or faulty sender with a new part.

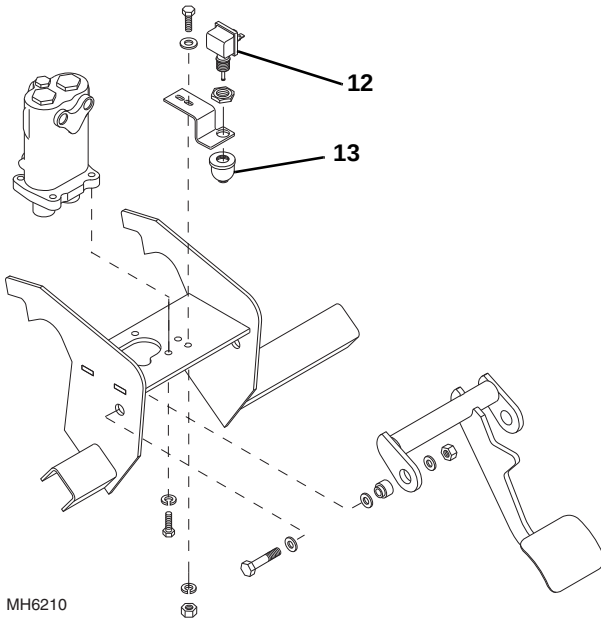
c. Transmission Temperature Sender Installation and Testing

1. Thread the transmission temperature sender into the transmission housing snugly, then connect the sender connector to the wiring harness connector.
2. Properly connect the battery.
3. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
4. Check for proper fluid level.
5. Start the engine, allow it to reach operating temperature and observe the operator display cluster for warning indication. If the sender is not defective, the problem could be elsewhere; possibly in a shorted wire, damaged transmission, improper or low fluid, etc.
6. Install the transmission covers.
7. Close and secure the rear door.



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9.10.5 Service Brake Switch



The service brake switch (12) works in conjunction with the Stabil-TRAK system. With the boom above 40°, the transmission shifter in either forward or reverse, and the service brake depressed, the Stabil-TRAK system engages. If the Service Brake Switch is suspect in the proper operation of the Stabil-TRAK system, refer to Section 10.5, "Stabil-TRAK System Test."

a. Service Brake Switch Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Label and disconnect the electrical connectors attached to the service brake switch.
6. Loosen locknut and remove switch dust cover (13). Remove switch body.

b. Service Brake Switch Installation

1. Ensure that there is only one thread showing above the locknut on the shaft of the switch body.
2. Insert switch body through the top of the service brake switch bracket.
3. Thread the switch dust cover onto the switch body until finger tight against the service brake switch bracket.
4. Use a wrench and fully tighten the locknut against the service brake switch bracket. There should now be approximately two or three threads showing above the locknut.
5. Thread the bottom lip of the switch plunger through the hole in the bottom of the dust cover.
6. Connect the cab harness electrical connectors to the service brake switch connectors.
7. Properly connect the battery.
8. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
9. Adjust the brake switch. Refer to Section 9.10.5, c. "Service Brake Switch Adjustment."

c. Service Brake Switch Adjustment

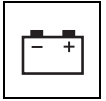
Note: The service brake switch adjustment will require two people. Enlist the help of an assistant before attempting to follow the adjustment procedure.

1. Remove the lower access panel.
2. Loosen locknut securing the switch body to the service brake switch bracket.
3. Connect a 1000 psi (69 bar) pressure gauge to the test port on the service brake valve.

WARNING

NEVER attempt to adjust the service brake switch without an assistant. Anytime the engine is running and the parking brake is disengaged, there must be an operator located in the cab and the two front tires must be blocked.

4. Block both front tires.
5. Start the engine and run at low idle.
6. Position the boom above 40°, release the park brake and place the transmission control lever in forward 4th gear.
7. Slowly depress and hold the brake pedal to maintain 150 ±50 psi (10,3 ±3,4 bar) brake pressure.

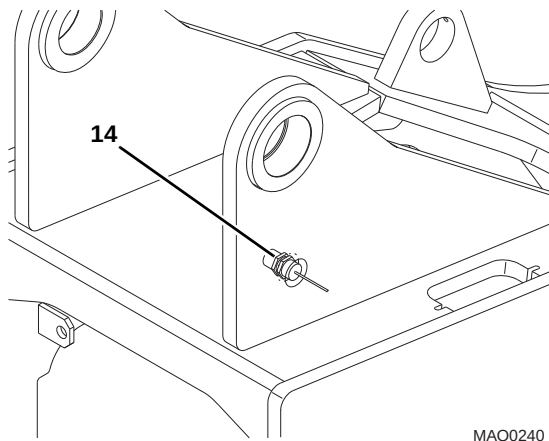


8. Using the switch dust cover and the locknut in combination, position the brake switch so the Stabil-TRAK dash light comes ON at the 150 ± 50 psi ($10,3 \pm 3,4$ bar) brake pressure.
9. Repeat steps 6 through 8 until the Stabil-TRAK dash light comes ON at 150 ± 50 psi ($10,3 \pm 3,4$ bar) brake pressure.
10. After the required pressure is achieved, use a wrench and fully tighten the locknut against the service brake switch bracket.

In order to test the switch for proper operation, the boom must be raised above the 40° position, the parking brake switch must be in the OFF position and the machine must be in a forward or reverse gear mode. Proper operation of the switch will activate the Stabil-TRAK dash panel indicator. If the Stabil-TRAK indicator does not activate when all conditions are met, the boom angle sensor must be adjusted. Refer to Section 9.10.6, c. "Boom Angle Sensor Installation."

11. Shut off the engine.
12. Remove the blocks from the front tires.
13. Remove the pressure gauge.
14. Install the lower access panel.

9.10.6 Boom Angle Sensor



The boom angle sensor (14) is located at the rear of, and on the right side of the machine. When the boom is lifted above 40° , the boom sensor sends a signal to the Stabil-TRAK indicator on the instrument cluster.

a. Boom Angle Sensor Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.

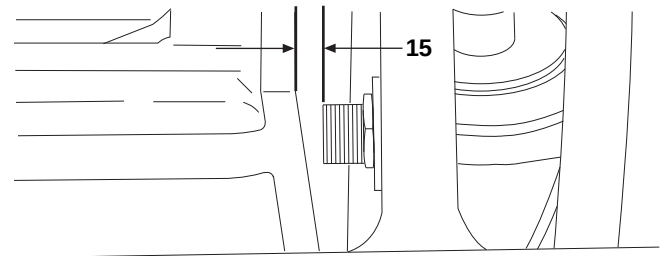
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Unplug the engine boom angle sensor connector from the wiring harness connector.
6. Loosen and remove the sensor locknut.
7. Remove the sensor from the outside of boom frame.

b. Disassembly

DO NOT disassemble the sensor. The sensor is not serviceable. Replace the sensor if found to be defective.

c. Boom Angle Sensor Installation

1. Install boom angle sensor through outside of boom frame.
2. Install locknut onto sensor.



3. Measure the clearance between the sensor and frame, and adjust sensor distance (15) to 0.120" (3,05 mm) and tighten locknut.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Close and secure the rear door.



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9.10.7 Boom Extend Interlock Sensor (10054 only)

The boom extend interlock sensor is located on the left side of the machine, on the outer boom frame and just behind the cab. The boom extend interlock sensor prohibits the last boom section from extending unless both outriggers are down and pressure is applied to the ground surface.

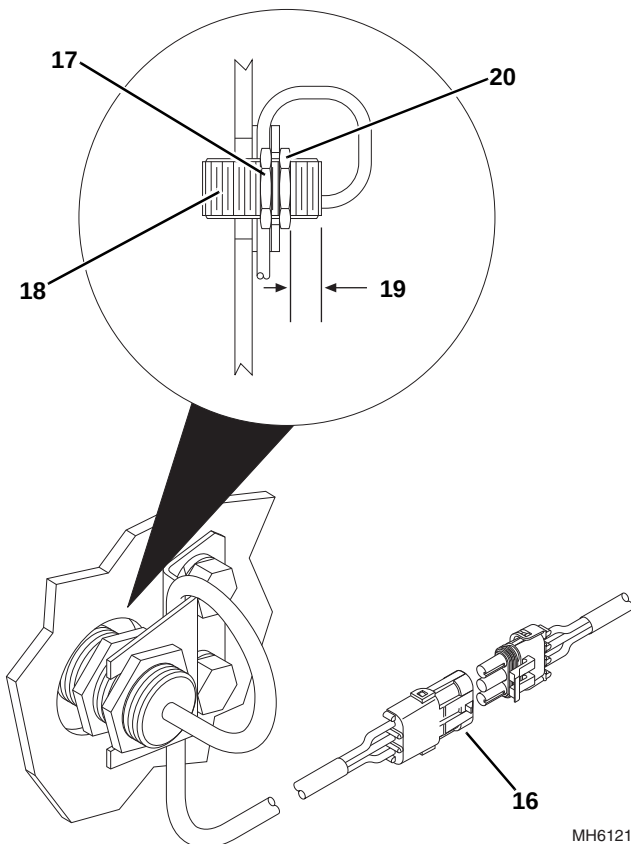
a. Boom Extend Interlock Sensor Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Make note of wire tie locations and clip wire ties where necessary.

7. Loosen the inside locknut (17) on the sensor (18).
8. Slide the sensor out of the bracket and remove.

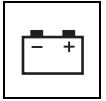
b. Boom Extend Interlock Sensor Installation

1. Partially install inside locknut (17) onto the sensor (18).
2. Make sure that there are four to six threads, approximately 0.975 in (24,7mm) and 1.0 in (25,4mm)(19), between the outside locknut (20) and the end of the sensor.
3. Make sure that the wire harness is between the bracket and the sensor, and slide the sensor into the bracket.
4. Connect the boom extend interlock sensor connector (16) to the boom extend harness connector.
5. Replace wire ties as necessary.
6. Properly connect the battery.
7. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
8. Close and secure the rear door.



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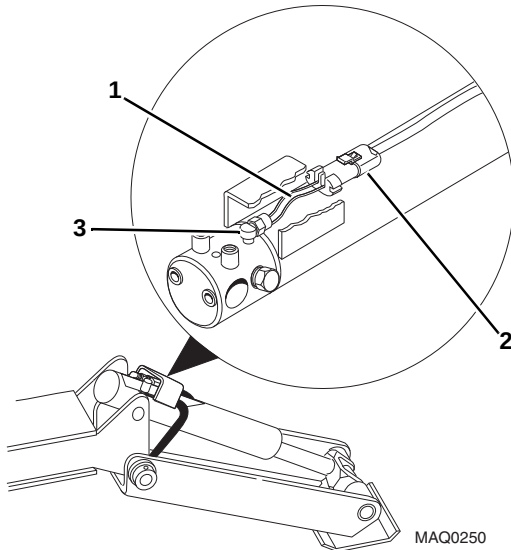
6. Disconnect the boom interlock sensor electrical connector (16).



9.10.8 Outrigger Pressure Switches (10054 Only)

a. Removal

1. Park the vehicle on a firm, level surface. Level the vehicle, ground the attachment, place the travel select lever in the (N) NEUTRAL position, place the neutral lock lever in the (N) NEUTRAL LOCK position and engage the parking brake switch.
2. Raise both outriggers fully, and shut the engine OFF.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.



6. Disconnect the pressure switch wiring connector (1) from the harness connector (2).
7. Remove the outrigger pressure switch (3) from the outrigger cylinder.
8. Wipe up any spilled hydraulic oil.

b. Installation

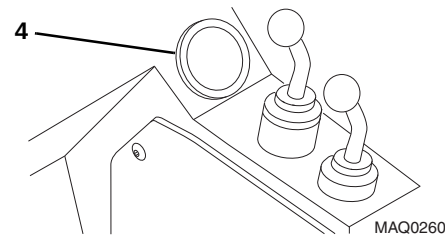
1. Install the pressure switch (3), and torque to 25-38 lb-ft (34-41 Nm).
2. Connect the pressure switch wiring connector (1) to the harness connector (2).
3. Properly connect the battery.
4. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
5. Close and secure the rear door.

9.11 DISPLAY MONITOR AND GAUGES

9.11.1 Instrument Cluster

a. Instrument Cluster Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.
5. Remove the right access panel.



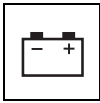
6. Unscrew the locking ring from below the instrument cluster (4). Pull the instrument cluster up and away from the cut-out, and unplug the harness connector.

b. Instrument Cluster Bulb Removal

1. Remove the instrument cluster from the cab. Refer to Section 9.11.1, a. "Instrument Cluster Removal."
2. Remove the instrument cluster rear cover plate.
3. Rotate the bulb assembly 1/4 turn counterclockwise and remove bulb.

c. Instrument Cluster Installation and Testing

1. Connect the harness connector to the instrument cluster terminal.
2. Place the instrument cluster into the cut-out, and install the plastic retaining ring and secure.
3. Install the right access panel.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Turn the ignition to the RUN position. All lights must illuminate for 3 seconds.
7. Close and secure the rear door.



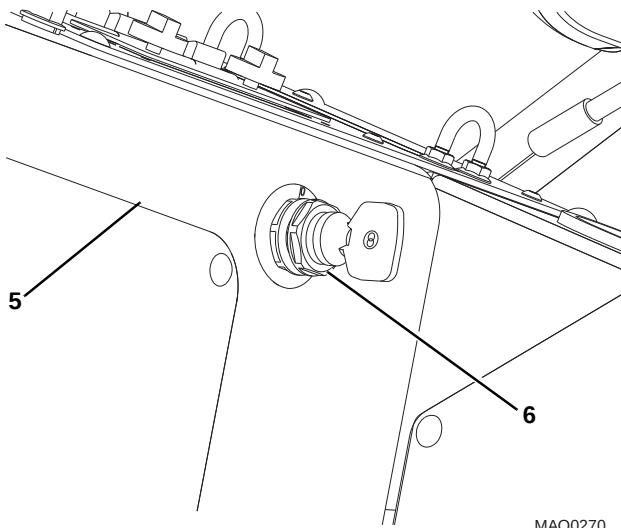
9.12 DASH SWITCHES

Note: For information on the front windshield wiper, rear window wiper and washer systems, refer to Section 9.8, "Window Wiper/Washer Windshield Wiper Motor."

9.12.1 Ignition Key Switch

a. Ignition Switch Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



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5. Remove the lower access panel (5).
6. From under the dash, remove the hex nut securing the ignition key switch (6) to the dash.
7. Label and disconnect the ignition switch connectors and remove the switch from the machine.

b. Disassembly

DO NOT disassemble the ignition switch. Replace a defective switch with a new part.

c. Inspection and Replacement

To determine the proper operation of the ignition key switch, test the terminals on the back of the switch for continuity with an ohmmeter.

Test the ignition key switch for continuity, by checking from the ignition (BLUE) wire to each of the following wires in each corresponding switch position. Continuity (X) should be present as indicated in the following chart:

Switch Position			
Test from BLUE wire to:	OFF	RUN	START
WHT Wire, Pin B on 3 Pin Connector			X

Test the ignition key switch for continuity, by checking from the ignition (RED) wire to each of the following wires in each switch position. Continuity (X) should be present as indicated in the following chart:

Switch Position			
Test from RED wire to:	OFF	RUN	START
PUR Wire, Pin B on 5 Pin Connector		X	X
RED/BLK Wire, Pin C on 5 Pin Connector		X	X

If all terminals do not show proper continuity, replace the ignition switch.

d. Ignition Switch Installation

1. Connect the ignition key switch to the previously labeled connectors.
2. The ignition switch has a drain hole located on the shaft, between the backing nut and the face of the ignition switch cylinder, behind the dash panel. Align the ignition switch so that when it is in the OFF position, the key slot is positioned vertically (straight up and down) and the indicator mark for the drain hole, is pointing down. Install the nut securing the ignition switch to the dash. DO NOT overtighten.
3. Install the lower access panel.
4. Properly connect the battery.
5. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
6. Close and secure the rear door.

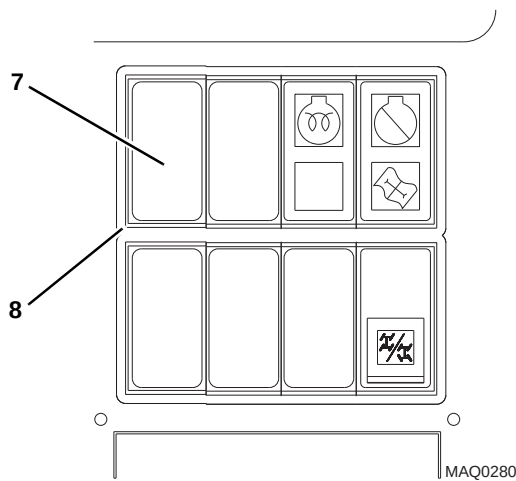
Note: If further information is needed, refer to Section 9.5, "Electrical System Schematics."



9.12.2 Dash Switches

a. Switch Removal

1. Park the machine on a firm, level surface, level the machine, fully retract the boom, lower the boom, place the transmission control lever in (N) NEUTRAL, engage the park brake and shut the engine OFF.
2. Place a Do Not Operate Tag on both the ignition key switch and the steering wheel, stating that the machine should not be operated.
3. Open the rear door. Allow the system fluids to cool.
4. Properly disconnect the battery.



5. Carefully pry the switch and wiring (7) out of the mounting plate (8).
6. Label and disconnect the wiring from the switch. Remove the switch.

b. Disassembly

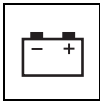
DO NOT disassemble the dash switch. Replace a defective switch with a new part.

c. Inspection and Replacement

Inspect the switch terminals for continuity and shorting in both the engaged and disengaged positions. Replace a defective or faulty switch with a new switch.

d. Switch Installation

1. Connect the switch to the cab harness connector.
2. Position the switch over the rectangular switch bezel and snap into position.
3. Properly connect the battery.
4. Remove the Do Not Operate Tags from both the ignition key switch and the steering wheel.
5. Start the machine and check the replaced switch for proper function.
6. Close and secure the rear door.



9.13 TROUBLESHOOTING

9.13.1 Fault Detection

Faults are detected while the key switch is in the RUN position, during operation of the machine itself. If a fault becomes active (currently detected) at this time, a fault is logged in memory and a snapshot of the engine parameters is logged. In addition, certain faults may illuminate the warning lamp (amber) or the stop lamp (red) depending upon the severity of the active fault.

For more information, contact your local authorized Cummins service distributor.

9.13.2 Flash-Out of Fault Codes

Fault flash-out mode can be entered through the use of a diagnostic switch or the accelerator pedal. To enter the fault flash-out mode, the key switch must be in the RUN position with the engine not running.

When a diagnostic switch is used to enter the fault flash-out code mode, the ECM will automatically flash the first fault code after the switch is turned to the RUN position.

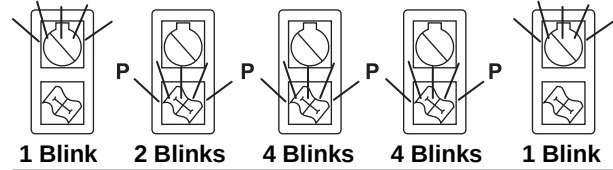
The diagnostic increment/decrement is used to sequence forward or backwards through the active faults.

To enter fault flash-out mode using the accelerator pedal, fully depress and release the pedal 3 times. Once in diagnostic mode, cycling the accelerator pedal will sequence forward through the active faults. The following graphic depicts the pattern of the fault code flash-out scheme as indicated by the stop lamp.

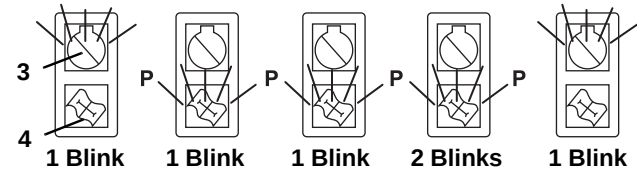
Example Fault Code Sequences

Fault Code 244:

P= Pause



Fault Code 112:



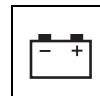
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Stop Lamp (3) - The stop lamp provides critical operator messages. These messages require immediate and decisive operator response. The stop lamp is also used to diagnose flash-out fault codes.

Warning Lamp (4) - The warning lamp provides important operator messages. These messages require timely operator attention. The warning lamp is also used to delineate diagnostic fault codes.

9.13.3 Offboard Diagnostics

INSITE™, is the Windows®-based PC service/programming/diagnostic tool for the Cummins engine. It is used to help troubleshoot and repair the engine with extended fault diagnostics and processing power. INSITE™ allows the user to view active and inactive faults and clear the inactive faults. It provides a monitor function that allows the service technician to monitor measured parameters, actuator status and some calculated values. It also provides the technician with the capability to turn on certain drivers such as the grid heaters and lift pump as well as running diagnostic tests such as single cylinder cutout.



9.13.4 Engine Fault Codes Chart

Fault Code	SPN Code	FMI Code	Description
0001			Exhaust Gas Pressure Sensor Number 1 Circuit - High
0002			Exhaust Gas Pressure Sensor Number 1 Circuit - Low
0003			Exhaust Gas Pressure Sensor Number 1 Circuit - Erratic
0004			Exhaust Gas Temperature Sensor Number 1 Circuit - Erratic
0005			Exhaust Gas Temperature Sensor Number 1 Circuit - Low
0006			Exhaust Gas Temperature Sensor Number 1 Circuit - High
111	629	12/12	Engine Control Module
115	612	2	Engine Magnetic Crankshaft Speed/Position
122	102	3/3	Intake Manifold Pressure Sensor Circuit - High
123	102	4/4	Intake Manifold Pressure Sensor Circuit - Low
124		0/16	Intake Manifold 1 Pressure Sensor Circuit
131	91	3/3	Accelerator Pedal or Lever Position Sensor Circuit - High
132	91	4/4	Accelerator Pedal or Lever Position Sensor Circuit - Low
133	974	3/3	Remote Accelerator Pedal or Lever Position Sensor Circuit - High
134	974	4/4	Remote Accelerator Pedal or Lever Position Sensor Circuit - Low
135	100	3	Oil Pressure Sensor Circuit - High
141	100	4/4	Oil Pressure Sensor Circuit - Low
143	100	1/18	Engine Oil Rifle Pressure
144	110	3/3	Engine Coolant Temperature 1 Sensor Circuit - High
145	110	4/4	Engine Coolant Temperature 1 Sensor Circuit - Low
146	110	0/16	Engine Coolant Temperature - High - Warning
147		1	Accelerator Pedal or Lever Position 1 Sensor Circuit - Low
148		0	Accelerator Pedal or Lever Position 1 Sensor Circuit - High
151	110	0/0	Engine Coolant Temperature - High - Critical
153	105	3/3	Intake Manifold Air Temperature Sensor Circuit - High
154	105	4/4	Intake Manifold Air Temperature Sensor Circuit - Low
155	105	0/0	Intake Manifold 1 Temperature
187	1080	4/4	Sensor Supply Voltage Number 2 Circuit - Low
195	111	3/3	Coolant Level Sensor Circuit - High
196	111	4/4	Coolant Level Sensor Circuit - Low
197	111	1/18	Coolant Level - Low
221	108	3/3	Barometric Pressure Sensor Circuit - High
222	108	4/4	Barometric Pressure Sensor Circuit - Low
227	1080	3/3	Sensor Supply 2 Circuit - High
234	190	0/0	Engine Crankshaft Speed/Position
235	111	1	Coolant Level - Low
237	644	2	External Speed Command Input (Multiple Unit Synchronization)
238	611	4/4	Sensor Supply 3 Circuit - Low
241	84	2/2	Vehicle Speed Sensor Circuit
242	84	10/10	Vehicle Speed Sensor Circuit Tampering Has Been Detected

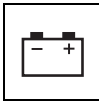


Electrical System

Fault Code	SPN Code	FMI Code	Description
245	647	4/4	Fan Control Circuit - Low
253	98	1	Engine Oil Level
268	94	2	Injector Metering Rail 1 Pressure
269	1195	2	Antitheft Password Valid Indicator
271	1347	4	High Fuel Pressure Solenoid Valve Circuit - Low
272	1347	3	High Fuel Pressure Solenoid Valve Circuit - High
275	1347	7	Fuel Pumping Element Number 1 (Front)
281	1347	7	Fuel Pump Pressurizing Assembly 1
284	1043	4/4	Engine Speed/Position Sensor (Crankshaft) Supply Voltage Circuit
285	639	9	SAE J1939 Multiplexing PGN Timeout Error
286	639	13	SAE J1939 Multiplexing Configuration Error
287	91	19	SAE J1939 Multiplexing Accelerator Pedal or Lever Sensor System Error
288	974	19	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Data
291	625	9	Proprietary Datalink Error
292	441	14	Auxiliary Temperature Sensor Input 1 - Special Instructions
293	441	3	Auxiliary Temperature Sensor Input 1 - High
294	441	4	Auxiliary Temperature Sensor Input 1 - Low
295	108	2	Barometric Pressure - Erratic
296	1388	14	Auxiliary Pressure Sensor Input 1 - Special Instructions
297	1388	3	Auxiliary Pressure Sensor Input 1 Circuit - High
298	1388	4	Auxiliary Pressure Sensor Input 1 Circuit - Low
319	251	2/2	Real-Time Clock Power Interrupt
322	651	5	Injector Solenoid Driver Cylinder 1 Circuit - Low
323	651	5	Injector Solenoid Driver Cylinder 5 Circuit - Low
324	653	5	Injector Solenoid Driver Cylinder 3 Circuit - Low
325	656	5	Injector Solenoid Driver Cylinder 6 Circuit - Low
331	652	5	Injector Solenoid Driver Cylinder 2 Circuit - Low
332	654	5	Injector Solenoid Driver Cylinder 4 Circuit - Low
334	110	2	Engine Coolant Temperature
341	630	2/2	Engine Control Module Data Lost
342	630	13	Electronic Calibration Code Incompatibility
343	629	12/12	Engine Control Module Warning Internal Hardware Failure
351	627	12	Injector Power Supply
352	1079	4/4	Sensor Supply Voltage Number 1 Circuit - Low
386	1079	3/3	Sensor Supply Voltage Number 1 Circuit - High
387	1043	3/3	Accelerator Pedal or Lever Position Sensor Supply Voltage Circuit - High
412	608	2	SAE J1587/J1922 Data Link - Can not Transmit
415	100	1/1	Engine Oil Rifle Pressure - Low
418	97	0/15	Water-In-Fuel Indicator - High
426	639	2	SAE J1939 Data Link - Can not Transmit
427	639	9	J1939 Datalink - Abnormal Update Rate
428	97	3/3	Water-In-Fuel Indicator Sensor Circuit - High



Fault Code	SPN Code	FMI Code	Description
429	97	4/4	Water-In-Fuel Indicator Sensor Circuit - Low
431	558	2/2	Accelerator Pedal or Lever Idle Validation Circuit - Erratic
432	558	13/13	Accelerator Pedal or Lever Idle Validation Circuit - Out of Calibration
433	102	2	Intake Manifold Pressure Sensor Circuit - Data incorrect
434	627	2/2	Power Supply Lost with Ignition On - Erratic
435	100	2/2	Oil Pressure Switch Sensor Circuit - Erratic
436	105	2	Intake Manifold 1 Temperature - Erratic
441	138	1/18	Battery 1 Voltage - Low
442	138	0/16	Battery 1 Voltage - High
443	1043	4/4	Accelerator Pedal or Lever Position Sensor Supply Voltage Circuit - Low
449	157	0	Injector Metering Rail Number 1 Pressure - High
451	157	3	Injector Metering Rail Number 1 Pressure Circuit - High
452	157	4	Injector Metering Rail Number 1 Pressure Circuit - Low
471	98	1/17	Engine Oil Level - Low
488	105	0/16	Intake Manifold 1 Temperature - High
497	1137	2	Multiple Unit Synchronization Switch - Erratic
498	98	3	Engine Oil Level Sensor Circuit - High
499	98	4	Engine Oil Level Sensor Circuit - Low
523	611	2	Auxiliary Intermediate (PTO) Speed Switch Validation - Erratic
527	702	3	Auxiliary Input/Output 2 Circuit - High
528	093	2	Auxiliary Alternate Torque Validation Switch - Erratic
529	703	3	Auxiliary Input/Output 3 Circuit - High
545	1188	7	Turbocharger 1 Wastegate Control - Not Responding
551	558	4/4	Accelerator Pedal or Lever Idle Validation Circuit - Low
553	157	0/16	Injector Metering Rail 1 Pressure - High
554	157	2	Injector Metering Rail 1 Pressure - Erratic
559	157	1/18	Fuel Pump Delivery Pressure Low
584	677	3/3	Starter Relay Circuit - High
585	677	4/4	Starter Relay Circuit - Low
595	103	0	Turbocharger Number 1 Speed High
596	167	0/16	Electrical Charging System Voltage High
597	167	1/18	Electrical Charging System Voltage Low - Moderately Severe
598	167	1/1	Electrical Charging System Voltage Low - Most Severe
599	640	14	Auxiliary Commanded Dual Output Shutdown - Special Instructions
649	1378	11/31	Change Lubricating Oil and Filter
687	103	18	Turbocharger Number 1 Speed Low
688	98	0	Engine Oil Level - High
689	190	2/2	Engine Crankshaft Speed/Position - Erratic
691	1172	3/3	Turbocharger Number 1 Compressor Inlet Temperature Sensor - High
692	1172	4/4	Turbocharger Number 1 Compressor Inlet Temperature Sensor - Low
731	723	7/7	Engine Speed Sensor/Position Camshaft and Crankshaft Misalignment
757	611	11/31	Engine Control Module Data Lost



Electrical System

Fault Code	SPN Code	FMI Code	Description
778	723	2	Engine Speed Sensor (Camshaft) Error - Erratic
779	703	11	Auxiliary Equipment Sensor Input #3 (OEM Switch)
784	1590	2	Loss of Communication with Adaptive Cruise Control
951	166	2	Cylinder Power Imbalance Between Cylinders
957	27	2	EGR Valve Position - Erratic
958	2795	2	VGT Position Sensor - Erratic
1117	627	2/2	Power Lost Without Ignition Off - Erratic
1139	651	7	Injector Solenoid Driver Cylinder 1 - Not Responding
1141	652	7	Injector Solenoid Driver Cylinder 2 - Not Responding
1142	653	7	Injector Solenoid Driver Cylinder 3 - Not Responding
1143	654	7	Injector Solenoid Driver Cylinder 4 - Not Responding
1144	655	7	Injector Solenoid Driver Cylinder 5 - Not Responding
1145	656	7	Injector Solenoid Driver Cylinder 6 - Not Responding
1228	27	2/2	EGR Valve Position - Erratic
1229	2795	2/2	VGT Position Sensor - Erratic
1239	2623	3/3	Accelerator Pedal or Lever Position Sensor 2 Circuit - High
1241	2623	4/4	Accelerator Pedal or Lever Position Sensor 2 Circuit - Low
1242	091	2/2	Accelerator Pedal or Lever Position Sensor Number 1 and 2 - Erratic
1633	625	2	Komnet Datalink Cannot Transmit
1639	703	11	Auxiliary Equipment Sensor Input Number 3 (OEM Switch)
1654	1323	11/31	Engine Misfire Cylinder 1
1655	1324	11/31	Engine Misfire Cylinder 2
1656	1325	11/31	Engine Misfire Cylinder 3
1657	1326	11/31	Engine Misfire Cylinder 4
1658	1327	11/31	Engine Misfire Cylinder 5
1659	1328	11/31	Engine Misfire Cylinder 6
1663	3241	11/31	Catalyst Inlet Temperature Sensor Swapped with Outlet
1664	3050	11/31	Catalyst Missing
1665	3241	4	Exhaust Gas Temperature 1 Circuit - Low
1666	3241	3	Exhaust Gas Temperature 1 Circuit - High
1667	3241	2	Exhaust Gas Temperature 1 - Erratic
1668	1761	4/4	Catalyst Tank Level Sensor Circuit - Low
1669	1761	3	Catalyst Tank Level Sensor Circuit - High
1671	1761	1/18	Catalyst Tank Level - Low - Moderately Severe
1673	1761	1	Catalyst Tank Level - Low - Most Severe
1674	3249	4	Exhaust Gas Temperature 2 Circuit - Low
1675	3249	3	Exhaust Gas Temperature 2 Circuit - High
1676	3249	2	Exhaust Gas Temperature 2 Circuit - Erratic
1677	3031	4	Catalyst Tank Temperature - Low
1678	3031	3	Catalyst Tank Temperature - High
1679	3031	2	Catalyst Tank Temperature - Erratic
1681	3361	12	Catalyst Dosing Control Unit

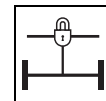


Fault Code	SPN Code	FMI Code	Description
1682	3362	11/31	Catalyst Reagent Dosing Unit Input Lines
1683	3449	3	Catalyst Tank Heater Circuit - High
1684	3363	4	Catalyst Tank Heater Circuit - Low
1687	3050	0	Catalyst Over Temperature
1689	251	12/2	Real-Time Clock Power Interrupt - Erratic
1692	3234	4	After treatment NOx Sensor - Low
1694	3234	2	After treatment NOx Sensor - Erratic
1697	3489	3	After treatment #1 Air Enable Actuator - High
1698	3489	4	After treatment #1 Air Enable Actuator - Low
1699	1761	2	Catalyst Tank Level Sensor - Erratic
1711	3361	9	Dosing Control Unit Datalink - Abnormal Update Rate
1712	3363	1/18	Catalyst Tank Heater Circuit - Low
1713	3363	0/16	Catalyst Tank Heater Circuit - High
1716	411	11	Auxiliary Temperature Sensor Input 1 Circuit
1717	3241	0/15	Exhaust Gas Temperature 1 - High
1718	1322	11/31	Engine Misfire for Multiple Cylinders
1848	105	10	Intake Manifold 1 Temperature - Abnormal Rate of Change
1849	3241	10	Exhaust Gas Temperature 1 - Abnormal Rate of Change
1851	3249	10	Exhaust Gas Temperature 2 - Abnormal Rate of Change
1892	84	1/18	Wheel-Based Vehicle Speed - Low
1911	157	0	Injector Metering Rail Number 1 Pressure - High
2183	1072	4	Engine Brake Actuator Driver 1 Circuit - Low
2185		3/3	Sensor Supply Voltage 4 Circuit - High
2186		4/4	Sensor Supply Voltage 4 Circuit - Low
2215	94	1	Fuel Pump Delivery Pressure - Low
2216	94	0	Fuel Pump Delivery Pressure - High
2217	630	11/31	Engine Control Module Calibration Program Memory (RAM) - Corruption
2249	157	1	Injector Metering Rail 1 Pressure - Low
2265	1075	3	Electric Lift Pump for Engine Fuel Supply Circuit - High
2266	1075	4	Electric Lift Pump for Engine Fuel Supply Circuit - Low
2271	27	3/3	Exhaust Gas Recirculation (EGR) Valve Position Sensor Circuit - High
2272	027	4/4	Exhaust Gas Recirculation (EGR) Valve Position Circuit - Low
2273	411	3/3	EGR Valve Differential Pressure Sensor Circuit - Shorted High
2274	411	4/4	EGR Valve Differential Pressure Sensor Circuit - Shorted Low
2292		16	Fuel Inlet Meter Device - High
2293		18	Fuel Inlet Meter Device Flow Demand Low
2311	633	11/31	Fueling Actuator Number 1 Circuit Error
2321	190	2	Engine Crankshaft Speed/Position - Erratic
2322	723	2	Backup Engine Speed/Position Sensor Number 2 - Erratic
2345	103	10/10	Turbocharger Speed - Invalid Rate of Change Detected
2346	2789	1/15	Exhaust Gas Temperature - High
2347	611	0/15	Turbocharger Compressor Outlet Temperature - High



Electrical System

Fault Code	SPN Code	FMI Code	Description
2348	27	13/13	EGR Valve Failed Automatic Calibration Procedure
2349	2791	5/5	EGR Valve Control Circuit - Low
2351	2791	4/4	EGR Valve Control Circuit - Low
2352	2791	3/3	EGR Valve Control Circuit - High
2353	2971	6/6	Exhaust Gas Recirculation (EGR) Valve Control Circuit - High
2357	2791	7/7	Exhaust Gas Recirculation (EGR) Valve Control - Not Responding
2359	411	0/16	Exhaust Gas Recirculation (EGR) Differential Pressure Sensor - High
2362	1072	4	Engine Brake Actuator Circuit #1 - Low
2363	1073	4	Engine Brake Actuator Circuit #2 - Low
2366	1072	3	Engine Brake Actuator Circuit #1 - High
2367	1073	3	Engine Brake Actuator Circuit #2 - High
2373	1209	3/3	Exhaust Gas Pressure Sensor Circuit - Shorted High
2374	1209	4/4	Exhaust Gas Pressure Sensor Circuit - Shorted Low
2375	412	3	EGR Temperature Sensor Circuit - High
2376	412	4/4	Recirculation Exhaust Gas (EGR) Temperature Sensor Circuit - Low
2377	647	3	Fan Control Circuit - High
2381	2795	4/4	Turbocharger Position Sensor Circuit - Shorted High
2382	2795	4/4	Turbocharger Position Sensor Circuit - Shorted Low
2383	641	5/5	Variable Geometry Turbocharger Actuator Circuit - Low
2384	641	4/4	VGT Actuator Driver Circuit - Low
2385	641	3/3	VGT Actuator Driver Circuit - High
2386	2975	6/6	Turbocharger Actuator Motor Circuit - High
2387	2975	7/7	Turbocharger Actuator Motor - Not Responding
2388	2795	13/13	Variable Geometry Turbocharger Actuator Position Failed Calibration
2554	1209	2/2	Exhaust Pressure Sensor Circuit - Erratic
2555	729	4	Intake Air Heater #1 Circuit - Low
2557	697	3	Auxiliary PWM Driver #1 - High
2558	697	4	Auxiliary PWM Driver #1 - Low
2771	3234	9	After treatment Outlet NOx Sensor - Abnormal Update Rate
2772	3226	0/15	After treatment Outlet NOx Sensor - High - Least Severe
2773	3226	0	After treatment Outlet NOx Sensor - High - Most Severe
2961	412	0/15	Exhaust Gas Recirculation (EGR) Temperature - High - Least Severe
2962	412	0/16	Exhaust Gas Recirculation (EGR) Temperature - High - More Severe
2963	110	0/15	Engine Coolant Temperature High - Least Severe
2964	105	0/15	Intake Manifold Temperature High - Least Severe
2973	102	2/2	Intake Manifold Pressure Sensor Circuit - Erratic
2976	3361	2	Dosing Control Unit Temperature - Erratic
9121	2791	0/15	Exhaust Gas Recirculation (EGR) Valve Actuator Over Temperature
9122	641	0/15	Variable Geometry Turbocharger Actuator Over Temperature

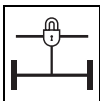


Section 10

Stabil-TRAK™ System and Boom Interlock System

Contents

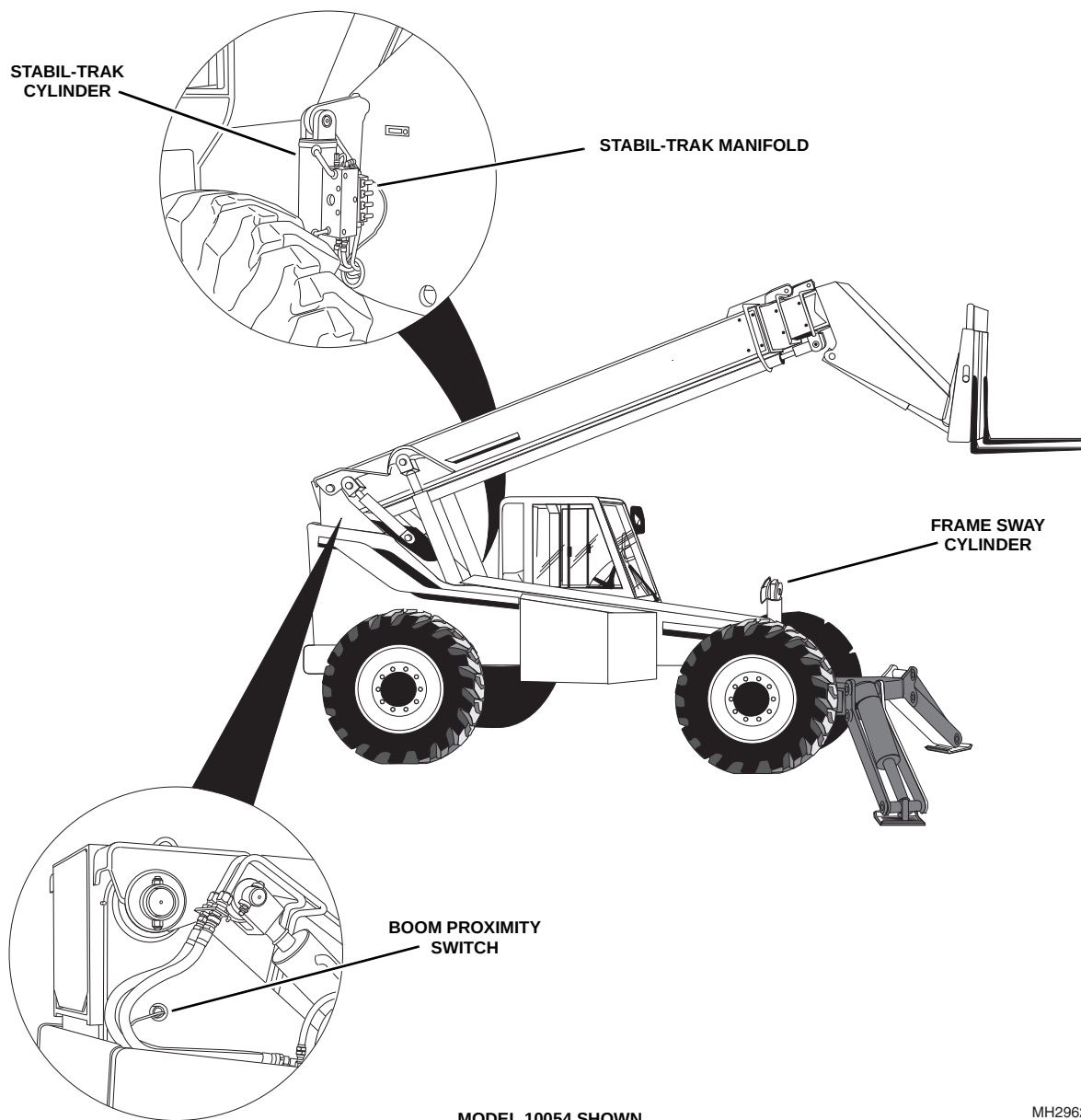
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10.2	Boom Extend Interlock System Component Terminology (10054 Only)	10-3
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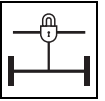


Stabil-TRAK™ System and Boom Interlock System

10.1 STABIL-TRAK SYSTEM COMPONENT TERMINOLOGY

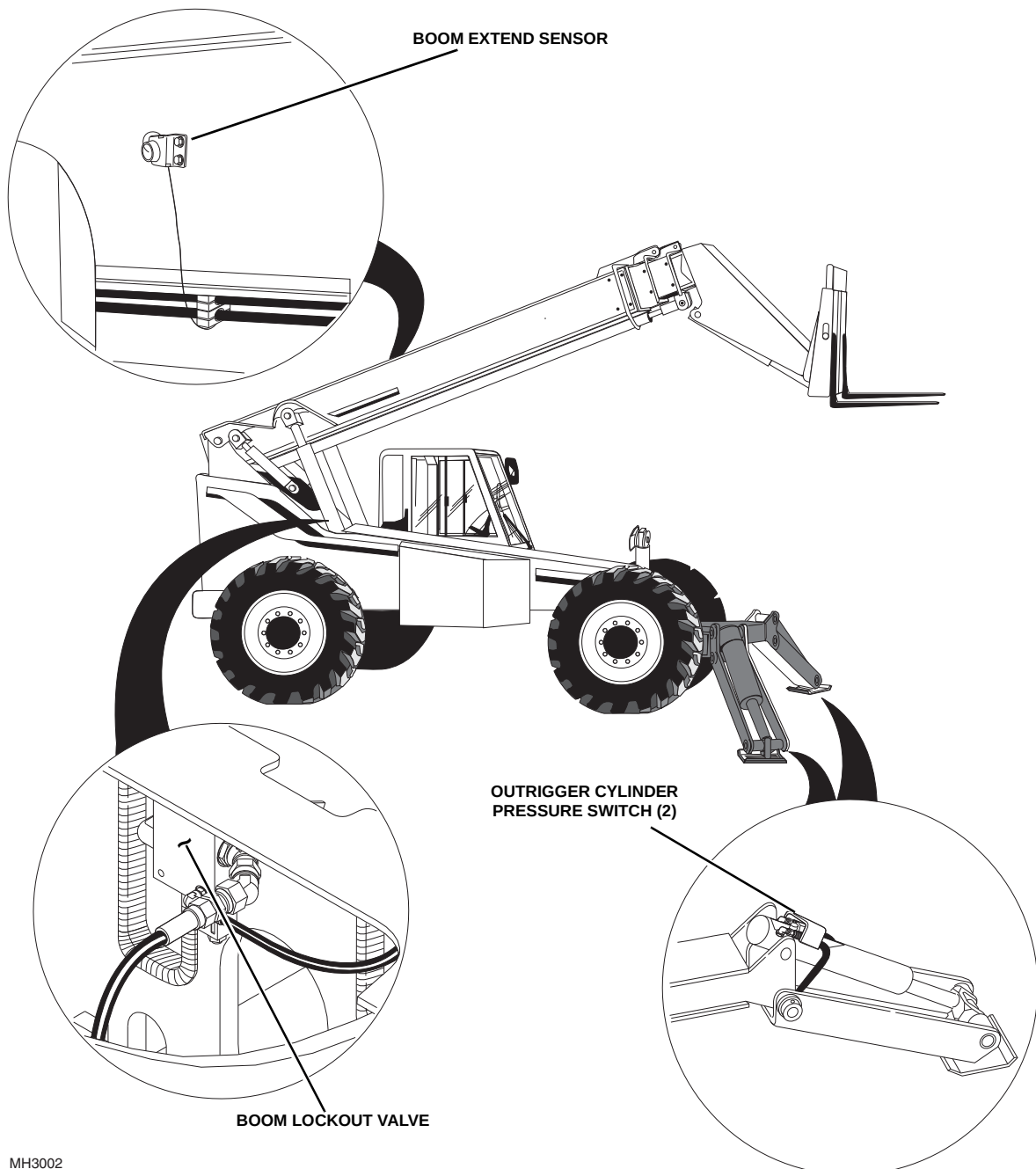
To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the Stabil-TRAK system. The following illustration identifies the components that are referred to throughout this section.



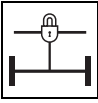


10.2 BOOM EXTEND INTERLOCK SYSTEM COMPONENT TERMINOLOGY (10054 ONLY)

To understand the safety, operation and maintenance information presented in this section, it is necessary that the operator/mechanic be familiar with the names and locations of the major assemblies of the boom extend interlock system. The following illustration identifies the components that are referred to throughout this section.



MH3002



10.3 STABIL-TRAK DESCRIPTION

The patented rear axle lock or Stabil-TRAK system works to stabilize the machine under various conditions. The appropriate Operation & Safety manual contains basic Stabil-TRAK information; a copy of the Operation & Safety manual should always be available in the storage compartment located on the left inside wall of the cab, next to the seat support.

The Stabil-TRAK lock system will be activated when the boom angle is greater than 40° and one or more of the following functions are activated:

- Engaging the Parking Brake Switch
- Placing the Travel Select Lever in (N) NEUTRAL
- Depressing and holding the Service Brake
- Model 10054 Only: Lowering both outriggers onto solid terrain, and extending the boom beyond a point between the “E” and “F” boom extend letters (approximately 40 ft(12 m))

With the boom lowered to an angle of less than 40°, the rear axle lock system is not active and none of these functions will affect the Stabil-TRAK system.

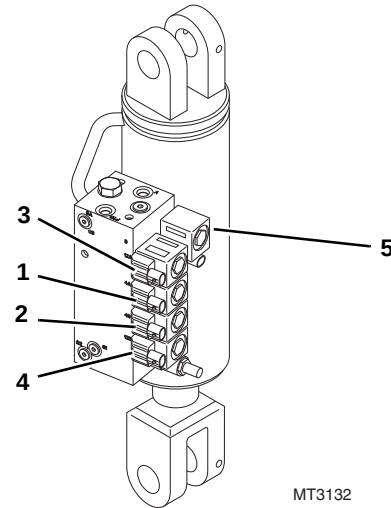
10.3.1 Stabil-TRAK Solenoid Valves

There are five Stabil-TRAK solenoid valves installed in the Stabil-TRAK manifold, attached to the stabilizer cylinder above the left side of the rear axle.

If a solenoid valve is suspected of malfunctioning, disconnect the coil wiring lead and test the coil for proper resistance (7-9 ohms) and for proper voltage from the harness (12 VDC). Replace the solenoid coil if open or shorted to ground.

Also inspect the valve cartridge, o-rings, and the other hydraulic and electrical components in the circuit to accurately determine the cause of the problem.

All solenoid coils are identical and can be interchanged for diagnostic purposes.

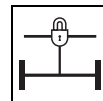


Note: DO NOT interchange solenoid valves 4A (1), 4B (2), 12A (3) or 12B (4) with solenoid valve 3 (5). These valves will fit into the other locations, but are configured differently internally and will not operate properly if interchanged.

Cartridge valves 4A (1), 4B (2), 12A (3) and 12B (4) are identical and can be interchanged for diagnostic purposes.

Note: Make sure the 0.060 orifices are in place when installing solenoid valves 4A (1) and 4B (2).

In general, if there is a problem with the Stabil-TRAK system beyond common electrical troubles, the involved electrical and hydraulic circuits should each be checked and the exact source of the problem diagnosed before any parts are replaced.



10.4 STABIL-TRAK ELECTRICAL CIRCUIT OPERATION AND TROUBLESHOOTING (6042, 8042 & 10042)

Note: Before using the 6042, 8042 and 10042 Stabil-TRAK System Troubleshooting chart and diagrams, complete the Section 10.5, "Stabil-TRAK System Test" to determine what part of the system is not functioning properly.

6042, 8042 and 10042 Stabil-TRAK System Troubleshooting			
	FREE PIVOT MODE	SLOW PIVOT MODE	LOCKED MODE
Switch/Relay/Solenoid Machine Conditions	Ignition On Boom Below 40° Boom Retracted PB & SB Released Trans. in Forward or Reverse	Ignition On Boom Above 40° Boom Extended PB & SB Released Trans. in Forward or Reverse	Ignition On Boom Above 40° Boom Extended PB & SB Applied & Trans. in Neutral
Solenoid 12A	E	DE	DE
Solenoid 12B	E	DE	DE
Solenoid 3	DE	DE	E
Solenoid 4A	DE	E	DE
Solenoid 4B	DE	E	DE
Boom Angle Sensor	C	O	O
Boom Switch Relay	E	DE	DE
Stabilizer Lock Relay	DE	DE	E
Stabilizer Light	OFF (DE)	OFF (DE)	ON (E)
Ignition Switch	C	C	C
Park Brake Switch	O	O	C
Service Brake Switch	O	O	C
Secondary Function Manifold Park Brake Solenoids	E	E	DE
Park Brake Disengage Relay	E	E	DE
Neutral Start Relay	DE	DE	E

Definitions:

PB = Park Brake

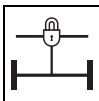
SB = Service Brake

DE = De-energized

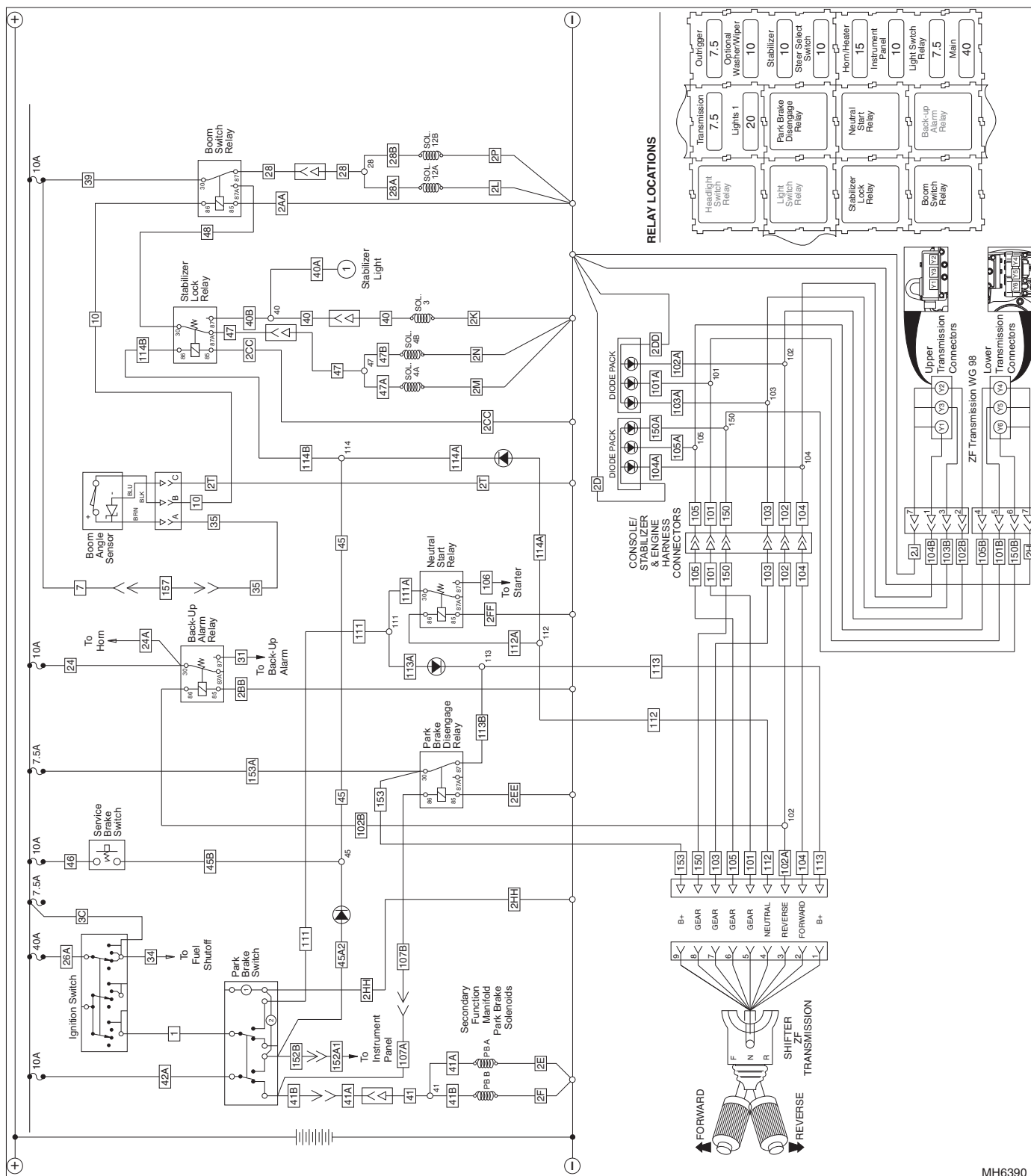
E = Energized

C = Closed

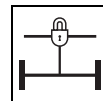
O = Open



Stabil-TRAK™ System and Boom Interlock System



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10.5 STABIL-TRAK SYSTEM TEST

Note: The operator must know that the Stabil-TRAK system is active and functioning properly.

To test the function of the Stabil-TRAK system, read the Stabil-TRAK System Test instructions and follow Steps 1 through 9 of Section 10.5.2, “Stabil-TRAK System Test Procedures.”

10.5.1 Stabil-TRAK System Test Instructions

- Test the Stabil-TRAK system with the machine on a level surface.
- Remove any attachment from the quick attach before performing the test.
- DO NOT extend the boom at any time during the test. Perform the test with the boom fully retracted.
- DO NOT raise the boom above 60° for Steps 3-6.
- DO NOT raise the boom above 45° for Steps 7-9.
- Follow Steps 1 through 9 of the Stabil-TRAK system test procedure exactly as written.

Note: If the Stabil-TRAK light goes OFF and the front left tire lowers to the ground at any time during Steps 4 through 7, the test was not performed properly or the Stabil-TRAK system is not functioning properly. Carefully repeat the steps starting with Step 1.

If the Stabil-TRAK light goes OFF and the front left tire lowers to the ground consistently during Steps 4 through 7, the Stabil-TRAK system is not functioning properly and the test should be stopped immediately. If the Stabil-TRAK system is not functioning properly, follow the procedures in Section 10.8, “Stabil-TRAK Hydraulic Circuit Operation and Troubleshooting,” to repair the system.

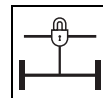
10.5.2 Stabil-TRAK System Test Procedures

If Steps 1 through 9 prove positive, the Stabil-TRAK system is functioning properly, and the machine can be returned to service. If any of these steps indicate that the Stabil-TRAK system is not functioning properly, follow the procedures in Section 10.8, “Stabil-TRAK Hydraulic Circuit Operation and Troubleshooting,” to repair the system.



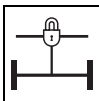
Stabil-TRAK™ System and Boom Interlock System

Stabil-TRAK System Test Procedures	
FREE PIVOT MODE	Step 1
	a. Enter the machine.
	b. Fasten the seat belt.
	c. Place the machine on a hard level surface.
	d. Have the boom fully retracted and horizontal.
	e. Place an 8 in (203 mm) wood or cement block in front of the front left tire.
	f. Turn the key to the RUN position.
	g. Check to be sure the Stabil-TRAK light is OFF.
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	Step 2
LOCKED MODE	a. Start the engine.
	b. Turn the parking brake switch OFF.
	c. Move the range select lever to (1) FIRST gear.
	d. Move the travel select lever to the (F) FORWARD position.
	e. Drive the machine up on the block.
	f. Use the frame sway control to level the machine back to 0°.
	Step 3
	a. Depress the service brake pedal.
	b. Move the travel select lever to the (N) NEUTRAL position.
	c. Raise the boom to <u>exactly 60°</u> . The Stabil-TRAK light should come ON when the boom angle is at about 40° and remain ON.
Service Brake Test	Step 4
	a. Use your left foot to depress the service brake pedal.
	b. With the range select lever in (2) SECOND gear, move the travel select lever to the (R) REVERSE position.
	c. Ease your left foot partially off the service brake pedal, make sure that the Stabil-TRAK light remains ON.
	d. With your right foot, increase the engine rpm slightly, as necessary, just enough to back the machine off the block. While backing off the block, the front left tire should remain off the ground.
	Note: Perform Steps 5 thru 9 with the engine rpm at idle.
	Step 5
	a. Keep the <u>service brake pedal</u> depressed.
	b. Move the travel select lever to the (N) NEUTRAL position.
	c. Take your foot off the service brake pedal. The Stabil-TRAK light should remain ON and the front left tire should remain off the ground.
Neutral Test	Step 6
	a. With the <u>travel select lever</u> in the (N) NEUTRAL position, engage the parking brake switch.
	b. Move the travel select lever to the (F) FORWARD position. The Stabil-TRAK light should remain ON and the front left tire should remain off the ground.
	Park Brake Test



Stabil-TRAK System Test Procedures

LOCKED MODE	Step 7	
	a. With the <u>parking brake switch</u> ON, move the travel select lever to the (N) NEUTRAL position.	
	b. Lower the boom to <u>exactly 45°</u> .	
	c. Frame sway the machine <u>no more than 5°</u> to the left.	
	d. Frame sway the machine back to 0°.	
	e. Frame sway the machine <u>no more than 5°</u> to the right.	
	Note: Observe that frame sway will be slower than normal during this test.	
	f. The Stabil-TRAK light should remain ON and the front left tire should remain off the ground. The front left tire should not raise or lower during frame sway.	
	g. Frame sway back toward 0°, leaving the machine swayed to the right approximately 1° to 2°.	
LOCKED MODE	Step 8	
	a. Depress the service brake pedal.	
	b. Disengage the parking brake switch.	
	c. With the range select lever in (1) FIRST gear, move the travel select lever to the (R) REVERSE position.	
	d. Release the service brake pedal to deactivate the Stabil-TRAK system.	
	e. The Stabil-TRAK light should go OFF.	
	f. The front left tire should return to the ground while the machine travels in reverse.	
	g. Depress the service brake pedal to stop the machine.	
SLOW PIVOT MODE	Step 9	
	a. With the service brake pedal depressed and the boom angle at <u>exactly 45°</u> , move the range select lever to (3) THIRD gear.	
	b. Move the travel select lever to (F) FORWARD.	
	c. Release the service brake pedal to deactivate the Stabil-TRAK system. The Stabil-TRAK light should go OFF.	
	d. Slowly drive the machine forward against the block to stop the machine from moving forward.	
	e. With the front left tire against the block, frame sway the machine <u>no more than 5°</u> to the left.	
	f. Check that the front left tire remains on the ground. It is normal for the front left tire to raise slightly when swaying to the left, but the tire should immediately lower when the frame sway function is stopped.	
	g. Frame sway the machine back to 0° and pause briefly.	
	h. Frame sway the machine <u>no more than 5°</u> to the right.	
	i. Check that the front right tire remains on the ground. It is normal for the front right tire to raise slightly when swaying to the right, but the tire should immediately lower when the frame sway function is stopped.	
	j. Frame sway the machine back to 0°.	
	k. Depress the service brake pedal.	
	l. Shift the travel select lever to (N) NEUTRAL.	
	m. Lower the boom.	
	n. Engage the parking brake switch, shut the engine OFF and remove the key.	
	o. Exit the machine using both handholds.	



10.6 STABIL-TRAK BOOM INTERLOCK ELECTRICAL CIRCUIT OPERATION AND TROUBLESHOOTING (10054)

Note: Before using the 10054 Stabil-TRAK System Troubleshooting chart and diagrams, complete Section 10.5, “Stabil-TRAK System Test” and Section 10.7, “Boom/Outrigger Interlock System Test (10054)”, to determine what part of the system is not functioning

properly. If an outrigger is raised or a pressure switch is defective, boom on the 10054 will not extend beyond the 42 Series extension limit.

10054 Stabil-TRAK System Troubleshooting				
		BOOM EXTEND MODE 1	BOOM EXTEND MODE 2	BOOM EXTEND MODE 3
Switch/ Relay Solenoid 	Machine Conditions	Ignition On Boom Below 40° Boom Retracted PB Released Trans. Fwd. or Rev. Outriggers Raised	Ignition On Boom Below 40° Boom Extended To 42 Series Extension Limit PB Released Trans. Fwd. or Rev. Outriggers Raised	Ignition On Boom Below 40° Boom Extended Beyond 42 Series Extension Limit PB Applied By Interlock Sys. Trans. In Neutral By Interlock Sys. Outriggers Lowered
Solenoid 12A	Stabil-TRAK Components Affected By Boom Interlock System	E	E	DE
Solenoid 12B		E	E	DE
Solenoid 3		DE	DE	E
Solenoid 4A		DE	DE	DE
Solenoid 4B		DE	DE	DE
Boom Angle Sensor		C	C	O
Boom Switch Relay		E	E	DE
Stabilizer Lock Relay		DE	DE	E
Stabilizer Light		OFF (DE)	OFF (DE)	ON (E)
Ignition Switch		C	C	C
Park Brake Switch		O	O	O
Park Brake Light		OFF (DE)	OFF (DE)	ON (E)
BOOM EXTEND INTERLOCK SYSTEM TROUBLESHOOTING				
Boom Extend Interlock Sensor		C	O	O
Boom Extend Interlock Relay		E	DE	DE
Boom Extend Lockout Relay		E	DE	DE
Outrigger Pressure Switches		O	O	C
Left Outrigger Lockout Relay		DE	E	E
Right Outrigger Lockout Relay		DE	E	E
Stabilizer Interlock Relay		DE	DE	E
Stabilizer Lock-Up Relay		DE	DE	E
Extend Circuit Solenoid Valve		E	E	E
Secondary Function Manifold Park Brake Solenoids		E	E	DE
Park Brake Interlock Relay		DE	DE	E
Park Brake Disengage Relay		E	E	DE

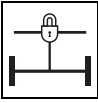
Definitions:

Boom Retracted = Less than 42 Series extension limit
 Boom Extended = Boom at 42 Series extension limit or greater.

PB = Park Brake
 DE = De-energized
 E = Energized

O = Open



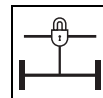


10.7 BOOM/OUTRIGGER INTERLOCK SYSTEM TEST (10054)

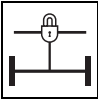
Before performing the following Boom/Outrigger Interlock System Test, perform Section 10.5, “Stabil-TRAK System Test,” to determine if the Stabil-TRAK system is working properly. If necessary, repair the Stabil-TRAK system before testing the boom/outrigger interlock system.

10.7.1 System Test Procedures

If Steps 1 through 5 prove positive, the Boom/Outrigger Interlock System is functioning properly, and the machine can be returned to service. If any of these steps indicate that the Boom/Outrigger Interlock system is not functioning properly, follow the procedures in Section 10.6, “Stabil-TRAK Boom Interlock Electrical Circuit Operation and Troubleshooting (10054),” to repair the system.

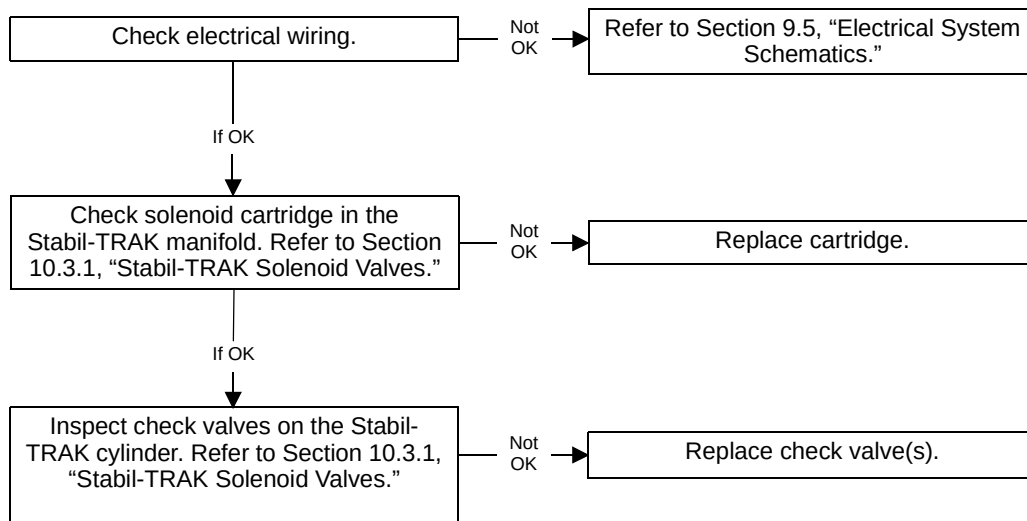


Boom/Outrigger Interlock System Test Procedures	
BOOM EXTEND MODE 1	Step 1 - Place the machine with no load on a hard, level surface such as blacktop or concrete. - Fasten your seat belt.
	Step 2 - With the outriggers in the raised position and the boom in a horizontal position, extend the boom. The boom should extend until the letter "E" appears and then should STOP. If the boom extends beyond the letter "F", retract the boom fully and have the system repaired before using the machine again. - Attempt to frame sway the machine to the right and left; it should frame sway normally.
BOOM EXTEND MODE 2	Step 3 - Lower both outriggers to the ground. DO NOT lift the front wheels of the machine off the ground at this time. The Stabil-TRAK light should come ON when the outriggers are lowered. - With the boom still in a horizontal position, extend the boom. - Attempt to raise both outriggers; they should not rise. If the outriggers rise, STOP and retract the boom and have the system repaired before using the machine again. - If the outriggers cannot be raised, attempt to lower the outriggers fully until both front wheels are off the ground; the outriggers should lower.
	Step 4 - Place the travel select lever in the (F) FORWARD position and the gear select lever in the (1) FIRST gear position. - Attempt to accelerate the machine; the machine should not move. - If the machine attempts to move, STOP and have the system repaired before using the machine. Note: Perform Steps 5 thru 9 with the engine rpm at idle.
BOOM EXTEND MODE 3	Step 5 - Attempt to frame sway the machine to the right and left; it should frame sway, but at a <u>slower</u> speed than normal. - The Stabil-TRAK light should remain ON. - Return the machine to a level position.
	Step 6 - Place the travel select lever in the (N) NEUTRAL position, move the neutral lock lever to the NEUTRAL LOCK position. - Fully retract the boom. - Raise the outriggers. - Engage the parking brake switch, shut the engine OFF and remove the key. - Exit the machine using both handholds.
BOOM EXTEND MODE 1	



10.8 STABIL-TRAK HYDRAULIC CIRCUIT OPERATION AND TROUBLESHOOTING

The Stabil-TRAK hydraulic circuit can be tested using these basic guidelines. For more hydraulic information, refer to Section 8.4.2, "Hydraulic Schematics."





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